Development of a Patient Condition Occurrence Frequency (PCOF) Database for Military Humanitarian Assistance, and Disaster Relief Medical Data

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14. ABSTRACT

The U.S. military is increasingly tasked to implement medical stability operations (MSOs). Current mandates by the Under Secretary of Defense for Personnel and Readiness establishes MSOs as a core U.S. military mission that the Military Health System (MHS) shall be prepared to conduct across the range of military operations (ROMO), including combat and noncombat environments. MSOs are given priority comparable to combat operations and are integrated across all MHS activities. However, programming the materiel resources in support of military operations that span the ROMO is contingent on accurately projecting the types of illness and injures that are likely to be received at deployed medical treatment facilities. This paper explains the methodology for developing accurate patient stream compositions for the ROMO. These missions include combat, noncombat, humanitarian assistance (HA), and disaster relief (DR) missions. This effort began with data development and then tool development. Using the Patient Condition Occurrence Frequency tool, a patient stream may be modified and adjustment factors may be applied to the scenario for age, gender, country, region, and more. The approach taken in this study leveraged available data collected after rigorous research. This research provided underlying data for a range of combat and noncombat missions.

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Development of a Patient Condition Occurrence Frequency (PCOF) Database for Military, Humanitarian Assistance, and Disaster Relief Medical Data

PCOF Derivation Methodology

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Contents

Executive Summary

United States military forces are increasingly being tasked to implement medical stability operations (MSOs). Current mandates by the Under Secretary of Defense for Personnel and Readiness establishes MSOs as a core U.S. military mission that the U.S. Department of Defense Military Health System (MHS) shall be prepared to conduct throughout all phases of conflict and across the range of military operations (ROMO), including combat and noncombat environments. MSOs are given priority comparable to combat operations and are explicitly addressed and integrated across all MHS activities, including doctrine, organization, training, education, exercises, materiel, leadership, personnel, facilities, and planning (Under Secretary of Defense for Personnel and Readiness, 2010). However, programming the materiel resources in support of military operations that span the ROMO is contingent on accurately projecting the types of illness and injures that are likely to be received at deployed medical treatment facilities.

In this paper, Naval Health Research Center provides an explanation of its methodology for developing accurate expected patient stream compositions (expressed in patient condition occurrence frequency, or PCOF, tables) for military operations across the ROMO. These missions include combat, noncombat, humanitarian assistance (HA), and disaster relief (DR) missions and are reported in the nomenclature used by military medical planners. This effort began with data development and then tool development. Using the PCOF tool, a patient stream composition may be modified by planners, and adjustment factors may be applied to the scenario for age, gender, country, region, and more (Wing & Brock, 2011).

HA patient encounter data were derived and developed from actual patient encounters documentation gathered from a broad range of HA missions, including the Continuing Promise and Pacific Partnership programs. For DR data, an exhaustive literature review was performed to collect and develop data that accurately depicts a DR event, but it is not drawn from individual patient encounters. Four scenarios encompass the vast majority of DR events: floods, tsunamis, earthquakes, and hurricanes (a.k.a., cyclones or typhoons).

Combat data were derived from Operation Enduring Freedom and Operation Iraqi Freedom sources and entered into the hybrid database developed for this project. The hybrid database draws from several sources, including the Theater Medical Data Store, the Standard Inpatient Data Record (SIDR), the Standard Ambulatory Data Record, and the Patient Administration Systems and Biostatistical Activity. This hybrid database is the source that enables the development of Joint PCOF tables.

Included in the PCOF tool are a set of “baseline” PCOF tables. These represent the ROMO and characterize recent patient distributions for HA, DR, combat, and noncombat operations. Adjustment factors available in the PCOF tool vary based on the type of operation and may include age, gender, geographic region, season, country, and phase. The ability to modify patient stream composition and adjustment factors enables planners and subject matter experts to develop customized PCOF tables for planned HA, DR, combat, and noncombat scenarios.

Introduction

The ability to prepare medical requirements for missions than span the range of military operations (ROMO) requires the determination of expected patient streams. The purpose of this paper is to describe the methodology to generate various patient condition occurrence frequency (PCOF) tables for combat as well as operations other than war missions that the military is becoming more involved with (Wing & Brock, 2011). This ability is derived by developing and refining a broad range of datasets used by a tool that was developed to allow various alterations of the distributions of broad categories as well as sub-categories. The resulting output is a distribution of trauma and disease conditions that will allow planners to configure their medical requirements and resources more accurately and appropriately.

Ideally, individual patient encounter data are used to develop the expected patient types and associated frequencies for a given scenario. Since a standardized electronic medical record is now used in theater, combat data is robust. Inpatient and outpatient databases can be queried by date and location to determine the quantity and type of patients seen for various operations. Standardized data collection is not employed during humanitarian assistance (HA) or disaster relief (DR) missions and therefore data are sparse. The challenges associated with HA and DR patient encounter data require a similar, but different method from combat PCOF table development to derive the injury and illness distributions.

This paper will not focus on the data limitations, but rather illustrate the method for employing disparate datasets to develop trauma and disease condition distributions across the ROMO.

Methodology

Data Development for Combat Missions

Accurate medical resource requirement forecasting for military operations is contingent upon obtaining reliable estimates of the likely casualty occurrences and the expected types of illnesses and injuries. These estimates include determination of the overall wounded in action, disease, and non-battle injury incidence rates, and the distribution of injuries and illnesses for the likely patient streams described by the PCOF tables. The PCOF tables are updated periodically, based on recent operational data, to accurately depict patient load and update injury profiles that reflect the improvements of protective gear and a wide range of enhancements in healthcare delivery in theater capabilities. Empirical data from U.S. combat missions Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) provide a rich informational source to aid in estimating the Joint PCOF table data distributions. To support this study, various data sets from OEF and OIF were combined into a “hybrid” database which includes data from the Theater Medical Data Store and the Patient Administration Systems and Biostatistics Activity. The hybrid database combines the strengths of each data source, and provides a more comprehensive representation of patient illness and injury types for combat missions (Zouris, D'Souza, & Elkins, 2011).

Casualty rates, when applied to the PCOF table data distributions, form representative patient streams. These are entered into medical performance models to determine requirements for medical supplies, personnel, and medical capabilities to support theater-level medical force planning. Such estimates have

been used for operation types. Using Joint Publication 3-0 “Joint Operations” as guidance, the range of PCOFs for stability operations, peace enforcement, and raid were selected because of the available data. Data from the hybrid database are robust for OEF and OIF and were used to derive the PCOFs stability and peace enforcement operations. Data for the development of raid PCOFs were composited of “Operation Gothic Serpent” (from the first Battle of Mogadishu) and the “Mayaguez Incident” (the last official battle of the Vietnam War, which was a raid of the Cambodian island of Koh Tang). The Joint Publication 3-0 does list other operation types like “Non-combatant Evacuation Operations,” but the three selected represent operations with available usable data.

To address environmental differences in mission PCOFs for Urban, Desert, Jungle, and Mountainous environments were selected. These operations types were derived from current military doctrine and are supported by empirical data from the hybrid database and by technical documents (Zouris, Walker, 2005).

The ambulatory outpatient visit (OPV) data for deployed personnel were developed from medical records obtained from the Armed Forces Health Longitudinal Technology Application-Theater module. The OPV records present relatively minor disease and trauma seen typically at roles of care 1 and 2 medical treatment facilities. Due to the large number of these records, the OPV casualty type was created. OPV PCOFs are separate from wounded in action, nonbattle injury, and disease (Zouris, D'Souza, & Elkins, 2011).

Data Development for DR Missions

An examination of the available data revealed events that dominated the range of natural disasters and were selected for this study. This examination included discovery in the Centre for Research on Epidemiology of Disasters (CRED) database. The CRED possesses a large range of data relevant to the disaster occurrence and the prevalence of these disasters worldwide. The threshold for considering a disaster event for inclusion in this effort was the prevalence of the disaster(s) and whether the event commanded large-scale immediate response to relieve an overwhelmed national medical disaster response. For instance, wildfires and volcanoes are listed as a disaster type in the CRED as are drought and insect infestations. While these events have may have potentially disastrous outcomes, wildfires and volcanoes have historically not overwhelmed existing medical capabilities nor have they required any significant medical response. These events, for the most part, allow for evacuation of populations to a safe haven well in advance of imminent danger. Droughts and insect infestations tend to be long term issues relative to climate and have not been the subject of large scale immediate disaster relief missions. Four disaster types encompass the vast majority of events worldwide that have overwhelmed existing medical resources. These events are floods, tsunamis, earthquakes, and hurricanes (a.k.a., cyclones or typhoons, depending on region of occurrence).

Since individual patient encounter data are generally not publically available following a disaster, data from published articles were analyzed and input into the database to develop the PCOFs for the given disasters. A search for injuries and diseases associated with the different types of disasters was performed. The search focused on articles that summarized the types of patients seen and treated by

field medical capabilities and hospitals. The literature review yielded 34 earthquake related articles: nine flood articles, six hurricane articles, and nine tsunami related articles. The articles were reviewed for event location, event time, scale of event, injury data, disease data, when the capability arrived, and how long the medical capability was available post event. The granularity of the data ranged from sparse individual encounter data to aggregated reporting of the types of patients seen. Table 1 describes a rating system used by the researchers to evaluate data suitability for use in the PCOF tool (developed by Department 161, Naval Health Research Center).

Table 1
Description of Data Rating System to Evaluate Data Suitability for the PCOF Tool

Rating	Rating description
1	Individual patient encounter data
2	Data reported at 3-digit ICD-9 level
3	Data reported at organ/system level diagnosis
4	Data reported by treatment type
5	Data reports on small subset of patients with specific injury types

Note: ICD-9 = *International Classification of Diseases, 9th Revision*.

The majority of the articles documenting the patient encounters after a natural disaster focused on disaster related trauma, although a few studies document the disease patients seen. For example, i n one study 90% of the patients seen after an earthquake at a field hospital were seeking treatment for non-traumatic medical, pediatric, or gynecological problems (Bar-Dayan, 2000). Another study assessed the disease patterns seen at a hospital after the 2004 tsunami and over 40% of the patients presented with a chronic disease (Guha-Sapir, 2006). When disease data were available, they were used to develop the disease PCOF tables. Disaster response data provenance documentation for these events is provided in Appendices B–E, respectively.

Data Development for HA Missions

The HA PCOF tables were developed from individual patient encounter data from U.S. Navy HA missions. Specific missions included in the dataset are Pacific Partnership 2007, Continuing Promise 2008, and Pacific Partnership 2009–2011. These data were collected from Medical Civil Action Programs (MEDCAPs) conducted in the following countries: Republic of the Philippines, Socialist Republic of Vietnam, Independent State of Papua New Guinea, Micronesia, Solomon Islands, Republic of the Marshall Islands, Independent State of Samoa, Kingdom of Tonga, Republic of Kiribati, Republic of Peru, Republic of El Salvador, Republic of Guatemala, Republic of Colombia, Dominican Republic, Co-operative Republic of Guyana, Republic of Haiti, Republic of Nicaragua, and Republic of Trinidad and Tobago. At the MEDCAP sites, patients could be seen by clinical areas such as medical, dental, optometry, dermatology, or immunizations (if they just required immunizations). The encounters were documented on a triplicate patient encounter form or electronically using the Global Relief Technologies, Rapid Data Management System. Data provenance documentation for these events is provided in Appendix F.

Results

Development of ICD-9s, ICD-9 Categories, and Subcategories

The PCOF table data distributions are generated by major category (e.g., skin, respiratory) with individual *International Classification of Diseases*, 9th Revision (ICD-9) codes associated with each major category. The initial major categories and sub-categories for the HA and DR PCOF tables were taken from a Nias, Indonesia data sheet developed by the International Medical Corps and downloaded from ReliefWeb (a United Nations Web site) in 2005. However, the Nias, Indonesia ICD-9 codes were restrictive to that particular mission. Therefore, researchers expanded the categories, sub-categories, and ICD-9s to account for additional data sources and to be consistent with current U.S. Department of Defense (DoD) medical planning policies. Consequently, distributions of the major categories, sub-categories, and ICD-9s for trauma and disease groups for HA and DR were refined. Furthermore, the ICD-9 codes were also not confined by the DoD patient condition codes for military combat operations. As a result, all DoD military combat ICD-9 codes are used in conjunction with the additional HA and DR ICD-9 codes. A list of all ICD-9s included in the data is provided in Appendix G.

Development of the PCOF Tool

To easily generate PCOF tables at the ICD-9 level, an Excel tool was developed which calculates the distribution of the major categories for disease and trauma as well as the sub-categories associated with each ICD-9, based on available data and subject matter expert (SME) input. Multiple data sources pertaining to the same disaster event may be used to generate the category and sub-category distributions for the different event types. To calculate the overall percentage of the major categories and sub-categories, the data are inputted into Excel with fields for diagnosis, frequency, gender, age group, and date. The distribution of the major categories is generated and grouped as trauma or disease, as displayed in Table 2.

Table 2
Major Category Patient Conditions Associated With Disease and Trauma in HA and DR PCOF Tables

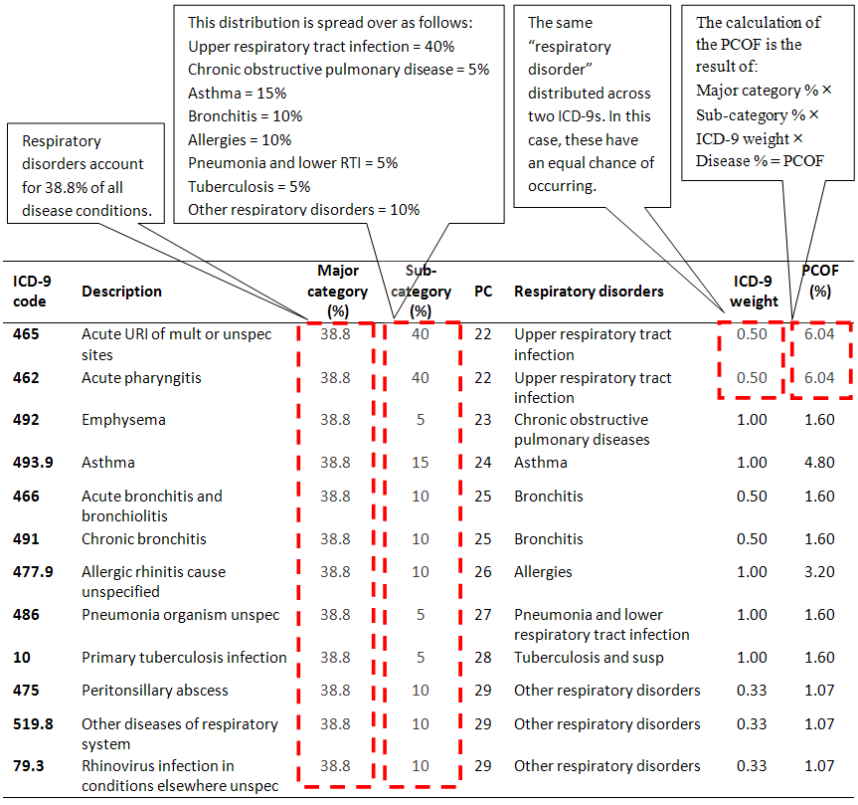
Disease patient condition categories	Trauma patient condition categories
Cardiovascular disorders	Amputations
Dental and oral disorders	Burns
Ear disorders	Crush injuries
Eye disorders	Dislocations
Gastrointestinal disorders	Fractures
General symptoms	Heat and cold
Genitourinary disorders	Insect bites
Infectious diseases	Internal injuries
Mental disorders	Intracranial injuries
Metabolism disorders	Open wounds
Musculoskeletal disorders	Other trauma and injury
Neoplasm	Sprains/strains

Disease patient condition categories	Trauma patient condition categories
Nervous system disorders	Superficial/contusions
Nutritional disorders	
Obstetric and gynecologic disorders	
Respiratory disorders	
Skin disorders	

Each ICD-9 included in the PCOF tool is mapped to a sub-category (e.g., "lumbago and backache unspecified" is associated with the sub-category "back pain") and each sub-category is grouped into a major category (e.g., "back pain" is in the "musculoskeletal" major category). To compute the PCOF table data for each ICD-9, the tool multiplies the percentage of the corresponding major category by the corresponding sub-category and then the ICD-9 is weighted by the number of ICD-9s that are associated with the same sub-category as shown here:

ICD-9% = major category % × sub-cat % × ICD9%

In some cases, the ICD-9s in a sub-category are distributed evenly, and in others, the distribution is not even. Figure 1 shows the distribution of ICD-9 data in the category. The two-level weighting schema is employed to ensure the categories are appropriately distributed and that the distribution is consistently derived in all categories and sub-categories. This example demonstrates the normalization of both the sub-category and the ICD-9 category.



ICD-9 code	Description	Major category (%)	Sub-category (%)	PC	Respiratory disorders	ICD-9 weight	PCOF (%)
465	Acute URI of mult or unspec sites	38.8	40	22	Upper respiratory tract infection	0.50	6.04
462	Acute pharyngitis	38.8	40	22	Upper respiratory tract infection	0.50	6.04
492	Emphysema	38.8	5	23	Chronic obstructive pulmonary diseases	1.00	1.60
493.9	Asthma	38.8	15	24	Asthma	1.00	4.80
466	Acute bronchitis and bronchiolitis	38.8	10	25	Bronchitis	0.50	1.60
491	Chronic bronchitis	38.8	10	25	Bronchitis	0.50	1.60
477.9	Allergic rhinitis cause unspecified	38.8	10	26	Allergies	1.00	3.20
486	Pneumonia organism unspec	38.8	5	27	Pneumonia and lower respiratory tract infection	1.00	1.60
10	Primary tuberculosis infection	38.8	5	28	Tuberculosis and susp	1.00	1.60
475	Peritonsillary abscess	38.8	10	29	Other respiratory disorders	0.33	1.07
519.8	Other diseases of respiratory system	38.8	10	29	Other respiratory disorders	0.33	1.07
79.3	Rhinovirus infection in conditions elsewhere unspec	38.8	10	29	Other respiratory disorders	0.33	1.07

Figure 1. Double weighting schema.

Adjustment Factor Development

After the initial data were input into the tool, other factors that would potentially change the distribution of patient conditions were considered. Even changes in the age distribution or sex distribution will change the distribution of patient conditions. The scenarios available in the PCOF tool serve as a baseline for planning for similar situations, but they can be adjusted manually or by changing adjustment factors associated with the mission. Potential adjustment factors were found in the literature and obtained from SME input. Some adjustment factors are applied to all three mission types and some are limited to one or two mission types.

Adjustment factor definitions.

The study plan provided that Naval Health Research Center would identify reliable, available data sources that would enable geographic, demographic (e.g., age, gender), climatic (related to disease prevalence), and seasonal factors to be used in the computation of PCOF distributions, and other adjustment factors that will act upon the base or generic PCOF table for a given scenario. These scenarios cross the ROMO and include HA, DR, and combat.

Selection of adjustment factors.

For the selection of adjustment factors, two main points were taken into consideration: an expected effect on the distributions by a factor and the availability of data to explain the effect. In the case of adjustment factors such as age and gender, it was obvious that these would have an effect upon either the disease or trauma distributions (e.g., men do not have gynecological conditions). There was also ample data which could explain the effect that age and gender had on disease and trauma conditions in a population. When developing the adjustment factor for season, it was determined that this was the only factor that effected distributions at the subcategory level, specifically on heat and cold injuries. All other adjustments to distributions are performed at the major category level.

However, some adjustment factors (i.e., arrival phase) were known through our literature search to have an effect on the distributions, but relatively little data existed to definitively explain this effect. In this case, we accepted the factor for inclusion and SME judgment, along with the data we did possess, was used to calculate the adjustment factor.

Some adjustment factors (i.e., altitude) were determined to have a possible effect. However, there was no data available to support this and no clear way of how the distributions should be changed. Also factors under consideration may not have directly affected the PCOF. For example, an adjustment factor such as magnitude may have appeared on the surface to be important factor, but upon closer inspection it was determined to only have an effect on the rate rather than the PCOF.

Adjustment factor decision flowchart.

The potential adjustment factors were assessed using the decision flowchart in Figure 2. Certain factors are applicable only to DR, such as response phase, whereas some apply to all mission types, such as season. Potential factors, and the results from the decision flowchart, are displayed in Figure 2 with

their associated mission type. The user can also alter the distributions of the broad categories and the sub-categories manually if they have specific intelligence about a potential mission. When selecting the range of potential adjustment factors, no reasonable factor was rejected.

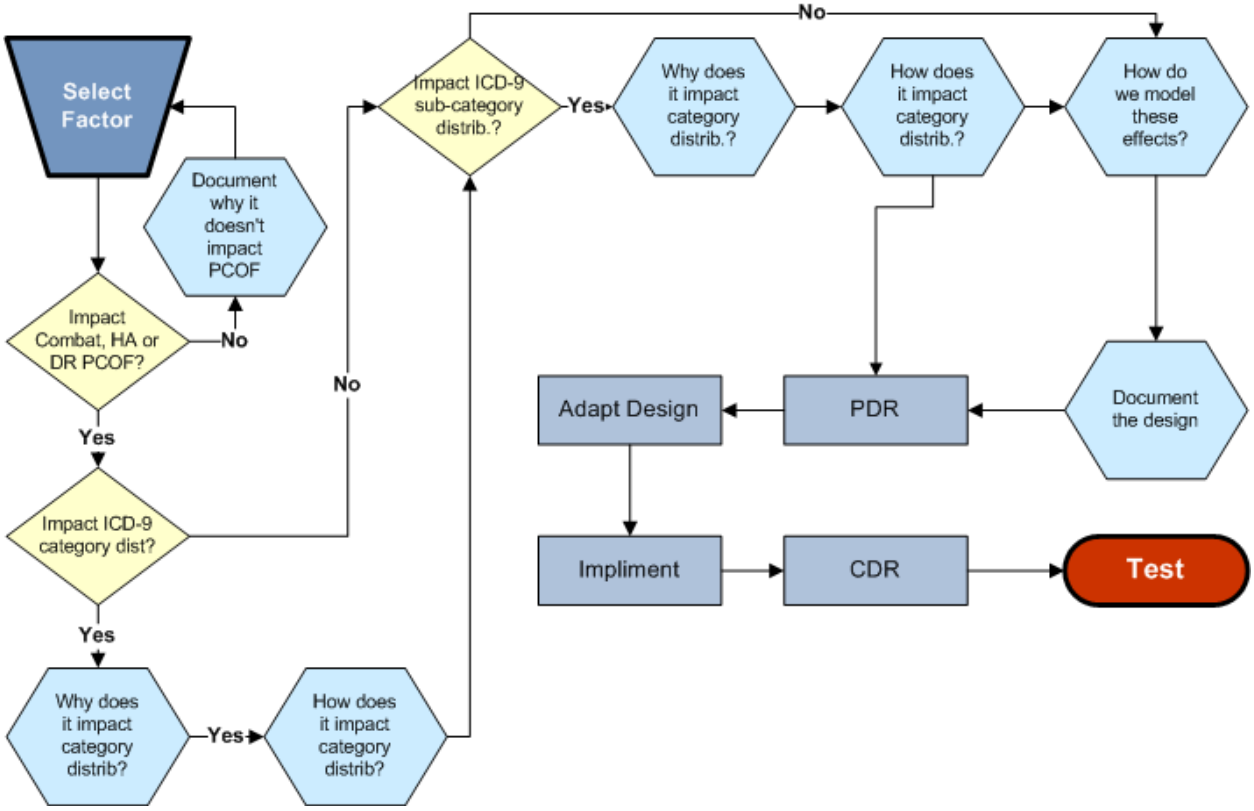


Figure 2. PCOF table development decision flowchart.

Table 3 provides a list of those factors examined in the discovery phase of this study. Also provided in the table is whether the factor applies to HA, DR, combat, or any combination, as well as whether the factor was omitted. Some factors apply only to DR. For instance, response phase and event type are specific for disasters and have no bearing on the HA or combat scenarios. Some factors apply only to combat, such as geographic regions and environment. Geographic region and environment are attended to in the country specific adjustment factor for HA and DR scenarios. This is because country specific information such as economic development factors is included in the factor development. While economic factors are not included in the tool, it is important to note their indirect effect on disease distributions.

Table 3

Adjustment Factor Matrix

Adjustment factors	HA ICD-9 effect	DR ICD-9 effect	Combat ICD-9 effect	Omit

Adjustment factors	HA ICD-9 effect	DR ICD-9 effect	Combat ICD-9 effect	Omit
Age	D, T	D, T	n/a	
Gender	D, T	D, T	D, NBI, W	
Event type	n/a	D, T	n/a	n/a
Response phase	n/a	D, T	n/a	n/a
Climate	D(i)	D(i)	D	n/a
Region	n/a	n/a	D	n/a
Economics	D(i)	D(i)	n/a	X
Season	D	D	D	n/a
Country	D	D	n/a	n/a
Environment (terrain)	n/a	n/a	n/a	X
Combat intensity	n/a	n/a	n/a	X
Magnitude	n/a	n/a	n/a	X
Level of care	n/a	n/a	n/a	X

Notes: D = distribution within disease is effected, NBI = distribution of nonbattle injury is effected, T = distribution within trauma is effected, W = distribution within wounded in action is effected, (i) = indirect effect. NBI = nonbattle injury. X = omit or omitted.

The intent from the beginning was to define these factors in a standardized manner that was familiar, logical, and/or based on the definitions provided in peer-reviewed articles and research. Familiar definitions include gender and season. Factors include:

a. Age (used in HA/DR only). The age ranges of 0–5, 6–15, 16–65, and 65 years or older are currently used by the International Medical Corps used in HA and DR missions. This range is also used to describe a country's demographics by the World Bank.

b. Gender (used in HA/DR and combat scenarios). Defined as male or female.

c. Region (used in combat scenarios only). The geographic regions are those areas assigned as combatant commands (CCMDs) as depicted in the Figure 3.

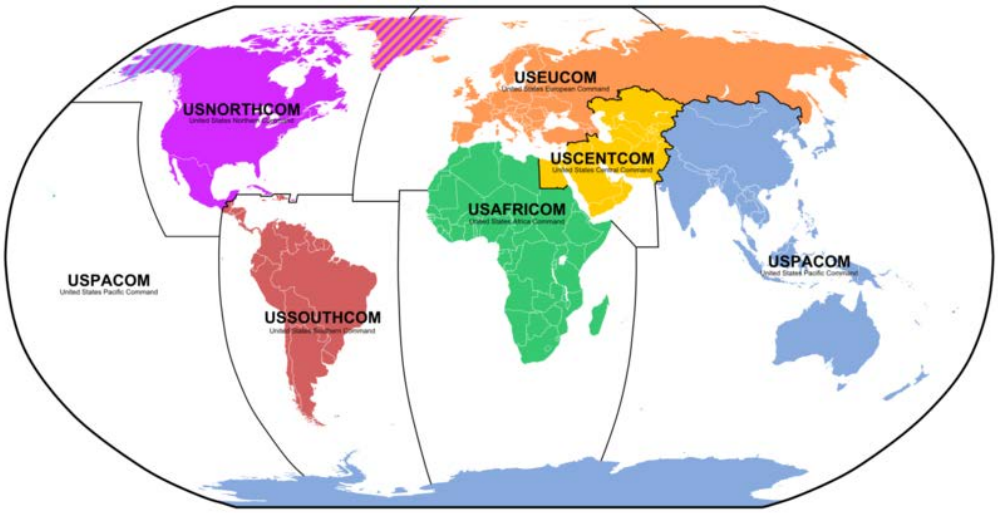


Figure 3. Geographic CCMDs.

d. Event type (used in DR scenarios only). The selected event types are Floods, Tsunamis, Earthquakes, and Hurricanes (a.k.a., Cyclones or Typhoons).

e. Response phase (used in DR scenarios only). Phases are divided into three periods. Early phase is from the day the events occurred through the 2nd day, middle phase are the 3rd–15th days, and late phase is after the 15th day. These phases are described in the Pacific Health Organization's manual on the use of foreign field hospitals (Pan America Health Organization, 2003).

f. Economic factors (omitted from study). Economic factors are considered in the country specific adjustment factor.

g. Season (used in HA/DR and combat scenarios). Standard definitions of spring, summer, fall and winter.

h. Environment (terrain) (omitted). The impact of terrain features on combat operations are better depicted as individual scenarios rather than attempting to develop adjustment factors to be applied across the range of combat operations.

i. Combat intensity (omitted—does not markedly effect PCOF distributions).

j. Magnitude (omitted—does not markedly effect PCOF distributions).

k. Level of care (omitted—does not markedly effect PCOF distributions).

l. Country (used in HA/DR only). This factor includes variables for geographic region, economic factors, and climate for specific regions. The country specific adjustments are derived from World Bank and World Health Organization data.

Algorithm Descriptions

Adjustment factor introduction.

In the proceeding formulas, the major categories are the largest aggregated categories, making up disease and trauma. As detailed in the following algorithms, when the user alters the adjustment factors, it creates a change in the major categories. The effects of the changes are summed together and added to the original baseline major category percentage to arrive at the final adjusted major category percentage.

$$Final\_Adjusted\_MC\%_i = Baseline\_MC\%_i + (Change\_MC\%Age + Change\_MC\%Gender \ldots)$$

After this has been done to each of the major categories, the distribution is normalized to 100% to arrive at the result of the adjustment factor application process. What follows is discussion on how each adjustment factor affects the major categories for disease or trauma.

Gender.

For age and gender the major category percentage is determined based on the Standard Ambulatory Data Record (SADR) data for the disaster missions. HA uses the actual data from the scenario to determine these values. The adjustment factor that is being multiplied by the major category

percentage weights the proportion of male to female within the major category, based on the male/female population in the reference data set, and the user defined new population.

The formula for determining the new value for the major category is as follows (with terms defined first):

M = % males in baseline population

F = % female in baseline population

M' = % males in target population

F' = % females in target population

MC_i = % of injuries in major category *i* in baseline PCOF

m_i = % of males with condition in major category *i* in baseline PCOF

f_i = % of females with condition in major category *i* in baseline PCOF ($m_i + f_i$ will not equal 100%; for example m_i could be 10% and f_i could be 5%)

The change in the major category caused by changing the gender is calculated as:

$Change\_MC\%_i = New\_MC\%_i - Baseline\_MC\%_i$

Age.

The age adjustment is calculated in a manner similar to gender.

The formula for determining the new major category is as follows (with terms defined first):

<5 = % <5 in baseline population

5to15 = % 5 to 15 in baseline population

16to65 = % 16 to 65 in baseline population

>65 = % >65 in baseline population

<5' = % <5 in user-adjusted population

5to15' = % 5 to 15 in user-adjusted population

16to65' = % 16 to 65 in user-adjusted population

>65' = % 16 to 65 in user-adjusted population

MC_i = % of injuries in major category *i* in baseline PCOF

$>5_i$ = % of >5 with condition in major category *i* in reference data set

$5to15_i$ =% of 5 to 15 with condition in major category *i* in reference data set

$16to65_i$ = % of 16 to 65 with condition in major category *i* in reference data set

$>65_i$ =% of >65 with condition in major category *i* in reference data set

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And the change in the major category caused by changing the age is calculated as:

$Change\_MC\%_i = New\_MC\%_i - Baseline\_MC\%_i$

Regional Adjustment (combat).

For the region adjustment in combat, data was aggregated from World War II (WWII) based on region of occurrence. The square root of the frequencies in each of the categories was to dampen down some of the effects caused by improvements in medical capabilities, and a distribution was formed for disease. This square root transformation is a common method of reducing the variance in a distribution.

The adjustment factor is calculated as:

$CCMD\_AF_i = Selected\_CCMD\_WWII\_MC\%_i / Baseline\_CCMD\_WWII\_MC\%_i$, where $Selected\_CCMD\_WWII\_MC\%_i$ is the major category percentage from the WWII data (after taking the square root, as mentioned above), for the user selected CCMD, and $Baseline\_CCMD\_WWII\_MC\%_i$ is the major category percentage from the WWII data for the baseline scenario.

And the change in the major category caused by changing the region is calculated as:

$Change\_MC\%_i = (Baseline\_MC\%_i * CCMD\_AF_i) – Baseline\_MC\%_i$, where $Baseline\_MC\%_i$ is the major category percentage for the baseline scenario, and $CCMD\_AF_i$ is the adjustment factor for the CCMD of the user selected scenario.

Response phase.

Response phase changes the ratio of disease to trauma. Based on SME input and help from reference articles, adjustment factors where developed to adjust the four most likely disease conditions to be affected by arrival phase (i.e., respiratory, infectious, gastrointestinal, and skin) and trauma conditions (i.e., fractures and open wounds).

$New\_MC\%_i = Baseline\_MC\%_i * Arrival\_Phase\_AF_i$, where $Arrival\_Phase\_AF_i$ is the determined by SME input and for the major categories specified above.

Where the $New\_MC\%_i$ for the adjusted major categories is held constant and the other disease categories are normalized so that the distribution sums to 100%.

The change in the major category caused by changing the arrival phase is calculated as:

$$Change\_MC\%_i = New\_MC\%_i - Baseline\_MC\%_i$$

Season (HA/DR).

The seasonal adjustment factor was determined by evaluating the disease major category distribution in the SADR by season. Odds ratios were used to determine adjustments for season. An odds ratio is a measure of effect size, and it is a ratio of the odds of an event occurring in one group as compared with a second group. Its general formulation is $(p1*q2) / (p2*q1)$, where $p1$ the probability of the event occurring in group 1 and $q1$ is the probability of the event not occurring in group 1. The odds ratios were calculated for each season based on a reference season, and from these, a percentage increase or decrease was determined for the categories based on the season. For example, if the odds ratio for the major category of respiratory disorders was 1.2 in the winter, as compared with the reference season of summer (with an odds ratio of 1), the odds ratio in winter would be used to adjust respiratory disorders if the season was changing from a baseline of summer to winter. This adjustment was only made in four major categories (i.e., gastrointestinal, respiratory, infectious, and skin disorders) that showed significant differences between the seasons. Therefore, to determine the category percentages for a season other than the original scenario, the following equations are used:

$New\_MC\%_i = Baseline\_MC\%_i * Selected\_Season\_Odds\_Ratio_i$, where $Selected\_Season\_Odds\_Ratio_i$ is the odds ratio for the season selected by the user (this only applies to the four major categories mentioned above)

Where the $New\_MC\%_i$ for the four adjusted major categories is held constant and the other disease categories are normalized so that the distribution sums to 100%.

The change in the major category caused by changing the season is calculated as:

$$Change\_MC\%_i = New\_MC\%_i - Baseline\_MC\%_i$$

Season (combat).

For combat, the seasonal adjustment factor was determined by evaluating the disease major category distribution in OIF and OEF data that had been parsed by season (this was the only combat data available that could be divided by season). The season selected by the user is compared with season in the baseline scenario (or an aggregation of seasons if the mission spans multiple seasons). The adjustment factor is determined as:

$Selected\_Season\_AF\_MC_i = Selected\_Season\_MC\%_i / Baseline\_Season\_MC\%_i$, where $Selected\_Season\_MC\%_i$ is the major category percentage in the parsed OIF and OEF data for the season chosen by the user, and $Baseline\_Season\_MC\%_i$ is the major category percentage in the parsed OIF and OEF data for the baseline season.

The new major category percentage is then calculated as:

$$New\_MC\%_i = Baseline\_MC\%_i * Selected\_Season\_AF\_MC_i$$

The change in the major category caused by changing the season is calculated as:

$$Change\_MC\%_i = New\_MC\%_i - Baseline\_MC\%_i$$

Country.

Disability adjusted life years (DALYs), which are the number of years lost due to ill-health, disability, or early death, were used to develop distributions of disease conditions for this country adjustment factor. For example, a country could have had 5,000 total years lost due to infectious disease and 2,500 years lost to respiratory disease. While DALYs are not exactly the same as knowing the raw number of people who contracted each disease, it is an approximation and the best data available for estimating disease occurrence in these countries. Each country was classified into a region (i.e., North America, South America, Europe, Asia/Pacific, and Africa) and climate type (i.e., tropical, dry/desert, temperate, and continental) according to the Koppen climate classification. This produced 16 possible region and climate combinations among the countries. For example, Brazil would fall under the South America/tropical region and climate combination. Each combination had the DALY totals for each country falling within it summed throughout the possible disease conditions, and a square root of these frequencies was used to dampen down the effects of the outliers. Finally, a distribution of these conditions was formed. These disease conditions closely conformed to our major category disease types.

The region & climate adjustment factor is calculated as:

$Region\&Climate\_AF\_MC_i = Selected\_Region\&Climate\_WHO\_MC\%_i$ / $Baseline\_Region\&Climate\_WHO\_MC\%_i$, where $Selected\_Region\&Climate\_WHO\_MC\%_i$ is the major category percentage in the World Health Organization (WHO) data, for the region & climate that the user selected country falls under (after taking the square root of the WHO data and re-normalizing to dampen down the effects), and $Baseline\_Region\&Climate\_WHO\_MC\%_i$ is the major category percentage in the WHO data for the region & climate that the baseline country falls under

The change in the major category caused by changing the country (region and climate) is calculated as:

$$Change\_MC\%_i = (Baseline\_MC\%_i * Region\&Climate\_AF\_MC_i) - Baseline\_MC\%_i$$

An economic adjustment is also made to three categories (i.e., respiratory, gastrointestinal, and infectious) based on SME input. Each country was categorized as low, low middle, upper middle, or high economically, based on data from the human development index (which measures the standard of living in a country).

$New\_MC\%_i = Baseline\_MC\%_i * Economic\_AF_i$, where $Economic\_AF_i$ is the determined by SME input for the three major categories specified above

Where the New_MC%$_i$ for the three adjusted major categories is held constant and the other disease categories are normalized to where the distribution sums to 100%.

The change in the major category caused by changing the country (economy) is calculated as:

$$Change\_MC\%_i = New\_MC\%_i - Baseline\_MC\%_i$$

Adjustment factor conclusion.

When the user has made changes to the adjustment factors the resulting distribution will be the addition of the baseline distribution to those changes caused by the adjustment factors; normalizing the result to 100%.

$$Final\_Adjusted\_MC\%_i = Baseline\_MC\%_i + (Change\_MC\%Age + Change\_MC\%Gender \ldots)$$

In the example in figure 4 changes in the Age Adjustment factor were made significantly shifting the age distribution towards the over 65 population. This resulted in the increase of diseases that are seen more frequently in an elderly population, like eye disorders, respiratory disorders and cardiovascular disorders. Conversely, there were decreases in the diseases more prevalent in younger populations, like gastrointestinal and ear disorders.

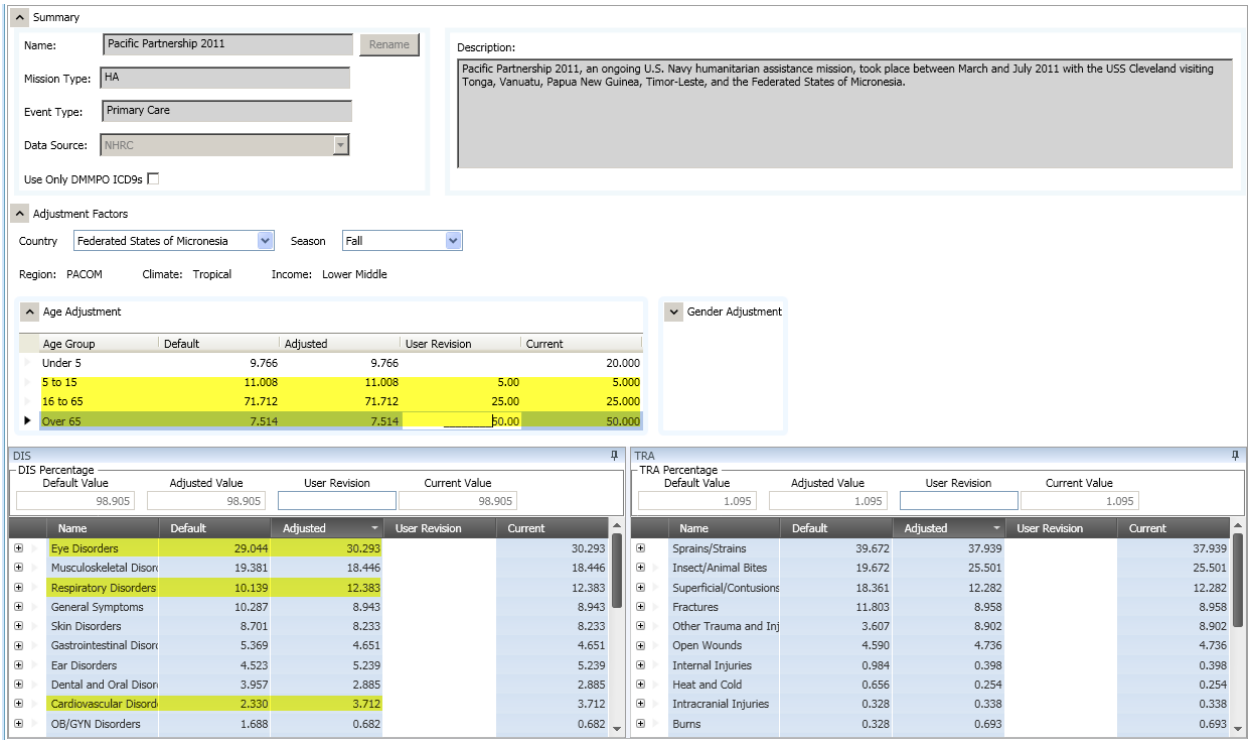

Figure 4. PCOF Adjustment Factor change

Conclusion

PCOF tables provide a valuable tool to predict an accurate expected patient load. This is the essential input needed for estimating equipment and supply requirements for a wide-range of combat,

noncombat, and military HA and DR operations. The approach taken in this study leveraged available data collected after rigorous research. This research provided underlying data for four DR types, eight HA operations, and a range of combat and noncombat missions. Included in the PCOF tool are six adjustment factors that can be applied to the range of scenarios allowing medical planners greater flexibility when developing contingency operations. Naval Health Research Center's approach provides quantified PCOF tables that are supported by datasets developed from the best sources available.

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Appendix A
Glossary of Terms

Abbreviation	Definitions
CCMD	combatant command
CRED	Centre for Research on Epidemiology of Disasters
DALY	disability adjusted life years
DoD	U.S. Department of Defense
DR	disaster relief
HA	humanitarian assistance
ICD-9	*International Classification of Diseases*, 9th Revision
MEDCAP	Medical Civil Action Program
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OPV	outpatient visit
PCOF	patient condition occurrence frequency
ROMO	range of military operations
SADR	Standard Ambulatory Data Record
SME	subject matter expert
WHO	World Health Organization

Appendix B
Disaster Relief Operations—Floods

Mumbai 2005 Flood

Location(s): The greater Mumbai area. Close to a meter of rain fell within 24 hours in some areas, producing flash flooding.

Date(s): Primarily July 26–27, 2005, with additional rains occurring over the next week.

Population affected: Basically, the entire Mumbai metropolitan area. There were over 1,000 deaths in the area, including 447 in the city of Mumbai. There were an estimated 5,000 deaths in western India due to rains and flooding. Over half a million people were evacuated and over 2.7 million people provided temporary assistance (primarily edible food and grains).

Type of medical facility reporting data: Hospitals in Mumbai, including specific data from a tertiary hospital.

Description of data.

Admissions by disease were reported at Mumbai hospitals for a 15-day period after the floods. The most common diseases were gastroenteritis (40.4%), fever (32.0%) and malaria (12.5%), leptospirosis (6.0%), and hepatitis (5.9%). The tertiary hospital reported on the following results for outpatient and inpatient admissions for an unspecified but presumably prolonged period after the flood.

Table 4
Tertiary Hospital Reports After Flooding

Diagnosis	Outpatient department attendance	Inpatient admissions
Malaria	5,514	746
Leptospirosis	626	282
Dengue fever	157	58
Undifferentiated fever	6,325	1,157
Community patients treated	200,516	–

This was part of a report looking at the command structure, planning, training, and community planning for disasters in the Mumbai region.

Limitations of data.

This first data set is limited since it covers only hospital admissions for a 2-week period. The second data set covers a non-reported period and reports results for only four diseases.

Data rating: 3

References.

1. Government of Maharashtra. *Maharashtra Floods 2005: Relief and Rehabilitation*. Retrieved from http://mdmu.maharashtra.gov.in/pdf/Flood/statusreport.pdf

2. Supe, A., & Satoskar, R. (2008). Health Services Responses to Disasters in Mumbai; Sharing Experiences, *Indian Journal or Medical Science*, *62*(6):242–251.

Bangladesh 1988 Flood

Location(s): Approximately 60% of Bangladesh was submerged, primarily in the Ganges, Brahmaputra, and Meghna river plains in the north and central part of the country.

Date(s): Late August through mid-September 1988.

Population affected: An estimated 45 million people were affected by the flood, including over 2,330 deaths.

Type of medical facility reporting data: Twenty-four physicians were sent by the Epidemic Control Preparedness Program (Bangladesh government) to provide health care services at 305 different locations in 72 "upazilas" (districts of Bangladesh are divided into sub-districts called upazila, which are similar to the county subdivisions found in some Western countries) covering 20 rural districts of Bangladesh. The program was active for 59 days from September to November 1988. Some critically ill patients were seen in boats or at home.

Description of data.

Physicians saw 46,750 patients over the 59-day period. Data of 154 deaths in one upazila was also recorded. Two tables on illnesses and diseases were presented; the first one showed the overall percentages for various disease/illness. Most common were respiratory tract infections (17.4 %), watery diarrhea (16.3), mucoid diarrhea (14.6), and intestinal worms (10.1). The following were also listed:

Table 5
Disease and Illness 1988 Bangladesh Flood

Disease/illness	Percent
Fever	6.5
Skin infections	5.8
Injury (w/infections)	5.1
Dysentery	3.8
Eye infections	2.2
Ear infections	1.8
Other diseases	16.3

A second table showed the percentage of various diseases/illnesses for children divided into three age groups (i.e., 0–4, 5–9, and 10–14 years). The report also presented sufficient information that the disease/illnesses percentages for those 15 years and older could be calculated. Two final tables showed

the causes of death in the one upazila recorded and the death causes by age group. Most common were diarrhea (27.3%), followed by respiratory tract infections (13.0%).

Limitations of data.

These data were limited because they only represent rural areas and were not a random sample. The areas visited by the physicians were pre-selected for the most part, and most patients had to have the ability to walk/travel to the facilities that were set up.

Data rating: 3

References.

1. Siddique, A.K., Baqui, A.H., Eusof, A., & Zaman, K. (1991). 1988 Floods in Bangladesh: Pattern of illness and causes of death, *Journal of Diarrhoeal Diseases Research*, *9*(4):310–314

2. Bangladesh–1988 Flood Affected Area Map. Available from http://www.sma-bd.com/site/index.php?option=com_content&view=article&id=127%3Abangladesh-1988-flood-affected-area-map&catid=30%3Amapping&Itemid=33

Table 6
Floods, Subject Matter Expert (SME) Adjusted

Category	Change justification	Current PCOF tables	SME adjusted
	Disease		
Nervous system disorders	Non-zero	0.0%	0.5%
Eye disorders	Bangladesh and Malaysia were in the 2–3% range.	0.2%	2.0%
Ear disorders	Pakistan and Bangladesh were in the 1–2% range	0.8%	1.0%
Dental and oral disorders	Non-zero	0.0%	0.5%
Respiratory disorders	Missouri had 10%, all others were at least 17%. Acute respiratory failure is typical.	24.5%	19.0%
Gastrointestinal disorder	Figures ranged from 10% to 45%; this is close to the median value. Diarrhea is common.	29.5%	26.0%
Genitourinary disorders	Low incidence when reported.	0.0%	1.5%
Cardiovascular disorders	Non-zero	0.0%	0.5%
Musculoskeletal disorders	Outside of floods usually a small percentage	0.0%	1.0%
Skin disorders	Main cause is contact with floodwaters. Bangladesh, Mozambique, Missouri, and Malaysia were in the 6% to 26% range.	31.5%	13.0%
Infectious diseases	Most of the estimate is for tropical infections, so the percentage should be reduced in temperate climates. Typical cases would be malaria, dengue, and leptospirosis. Doesn't factor in cholera, which could claim a large percentage if it occurs. Percentages from Mozambique, Sudan, and some provinces in Pakistan were in the twenties. (Viral infections estimated around 1%.)	3.5%	16.0%
General symptoms	Conservative estimate in line with the majority of data, although one province in Pakistan was at 26%.	10.1%	9.5%
Metabolism disorders	Non-zero	0.0%	0.5%

Category	Change justification	Current PCOF tables	SME adjusted
Nutritional disorders	Beyond dehydration, much of this will be based on malnourishment, especially in children. Figure could definitely go higher in catastrophic floods in poorer regions.	0.0%	4.5%
Obstetric/gynecological disorders	Figure may go higher in later stages.	0.0%	1.5%
Mental disorder	Figure of 2% in Bangladesh. Rates were estimated at 2 to 3 times above normal in European floods.	0.0%	2.5%
Neoplasm	Non-zero	0.0%	0.5%
	Trauma		
Fractures	Could be higher in flash flooding	0.0%	3.0%
Open wounds	Could be higher in flash flooding	0.0%	4.0%
Amputations	Non-zero	0.0%	0.5%
Intracranial injuries	Non-zero	0.0%	1.0%
Crush injuries	Non-zero	0.0%	0.5%
Burns		2.8%	2.5%
Internal injuries	Non-zero	0.0%	1.5%
Superficial/contusions	Based largely on Missouri figures	35.4%	30.0%
Dislocations	Non-zero	0.0%	4.5%
Sprains/strains	Based largely on Missouri figures	35.0%	33.0%
Insect bites	Lower in temperate climates.	2.4%	2.0%
Heat and cold	Non-zero	0.0%	2.5%
Other trauma and injury	Non-zero	24.4%	15.0%

Appendix C
Disaster Relief—Tsunami

Indian Ocean Tsunami Event in Banda Aceh, Indonesia

Location(s): Banda Aceh, Indonesia.

Date(s): December 26, 2004

Population affected: A pre-tsunami population of 500,000.

Type of medical facility reporting data: Data comes from two Red Cross field hospitals and two clinics operated by the Singapore Armed Forces (SAF) Medical Team.

Description of data.

The SAF Medical Team set up two clinics in Banda Aceh. The first clinic was set up on December 31, 2004 in the Ulee Kareng district of Banda Aceh and remained there for 1 week. There were 767 disease records and 254 trauma records reported from Ulee Kareng. During the 2nd week of deployment, the Medical Team moved to the Sekolah Calom Tamtama (SECATA) district of Banda Aceh. Here they saw 967 disease patients and 48 trauma patients. When the data for the two sites was combined, the disease records were classified as data rating Level 3 and the trauma records were classified as data rating Level 5. The top three disease conditions for the two sites were the same: respiratory disorders, musculoskeletal disorders, and gastrointestinal disorders. The trauma records were only reported as unspecified injuries (Fan, 2006).

One Red Cross field hospital was set up by the International Committee of the Red Cross (ICRC) on January 15, 2005 and remained until January 31, 2005. There were 1,072 disease records and 116 trauma records reported in the article. The disease records were classified as data ratings Level 3 and Level 4 (the data contained a combination of the two types). The hospital saw in increase in chronic diseases during the 1st week and a decrease in the 2nd week. The top three disease categories that were reported were respiratory disorders (23.3%), other chronic diseases (19.2%), and other acute diseases (16.7%). The trauma records were classified as data rating Level 5 because they were only indentified as unspecified injuries (Guha-Sapir et al., 2006).

Another Red Cross field hospital was set up by the ICRC on January 16, 2005. There were 257 disease records and 22 trauma records that were reported by the article. The disease records were classified as data rating Level 3 and the trauma records were classified as data rating Level 4. While the *n* size was small, the article did provide good information on a variety of disease conditions. The trauma data was mostly limited to fractures. The disease data were broken out into male, female, and unknown. The top three disease conditions were genitourinary disorders (20.6%), gastrointestinal disorders (17.1%), and respiratory disorders (12.8%). Fractures made up 82% of the injury categories (Redwood-Campbell et al., 2006).

Limitations of data.

The limitations for the data coming from Banda Aceh were the lack of quality trauma data and the length of time after the event that the data was collected. Although one of the field hospitals was set up on January 16th, the data reported in the article was collected from this field hospital 9 weeks after the tsunami. Also, the large majority of the trauma data was only reported at the data rating Level 5. A small portion of the disease data from these sites were not classified at the data rating Level 3.

Data Source	Data rating Disease	Data Rating Trauma	Time Bracket	Date Entered	Analyst
1	3	5	Collected between 1 and 2 weeks after event	Not yet entered	Trevor Elkins
2	3 & 4	5	Collected between 1 and 3 weeks after event	Not yet entered	Trevor Elkins
3	3	4	Collected 9 weeks after event	Not yet entered	Trevor Elkins

References.

1. 1. Fan, S.W. (2006). Clinical cases seen in tsunami hit Banda Aceh—From a primary health care perspective. *Annals Academy of Medicine*, *35*(1), 54–59.

2. 2. Guha-Sapir, D., van Panhuis, W.G., & Lagoutte, J. (2006). Patterns of chronic and acute diseases after natural disasters–a study from the International Committee of the Red Cross field hospital in Banda Aceh after the 2004 Indian Ocean tsunami. *Tropical Medicine and International Health*, *12*(11), 1338–1341.

3. 3. Redwood-Campbell L.J., & Riddez, L. (2006). Post-tsunami medical care: Health problems encountered in the International Committee of the Red Cross hospital in Banda Aceh, Indonesia. *Prehospital and Disaster Medicine*, *21*(1), s1–s7.

Flood import.

The table below is the result of our literature review; it is the import used to populate flood data in the PCOF tool.

Flood disease conditions	Frequency
Skin disorders	52,159
Gastrointestinal disorder	48,795
Respiratory disorders	40,550
General symptoms	16,658
Infectious disease	5,721
Ear disorders	1,346
Superficial/contusions	953
Sprains/strains	942
Other trauma and injury	657
Eye disorders	337
Burns	75
Insect bites	65
Amputations	0

Flood disease conditions	Frequency
Cardiovascular disorders	0
Crush injuries	0
Dental and oral disorders	0
Dislocations	0
Fractures	0
Genitourinary disorders	0
Heat and cold	0
Internal injuries	0
Intracranial injuries	0
Mental disorder	0
Metabolism disorders	0
Musculoskeletal disorders	0
Neoplasm	0
Nervous system disorders	0
Nutritional disorders	0
Obstetric/gynecological disorders	0
Open wounds	0

Indian Ocean Tsunami Event in Sri Lanka

Location(s): The Matara and Hambantota districts of Sri Lanka.

Date(s): December 26, 2004.

Population affected: Not reported in the article, but the two districts have a combined population of 1,287,784. In Sri Lanka 29,729 people were killed and 16,665 were injured.

Type of medical facility reporting data: A field clinic set up by a Korean Disaster Medical Assistance Team.

Description of data.

The field clinic was set up on January 2, 2005 and remained until January 8, 2005. The article reported 2,687 disease records and 572 trauma records. The disease records were classified as data rating Level 3 and the trauma records were classified as data rating Level 5. The disease data was broken down into pediatric (26.8%), adult (63.2%), and geriatric (10.0%). The disease data fit very well into the data rating Level 3 categories. However, the trauma is data rating Level 5 of little use as it only identifies the trauma as unspecified. The top three disease conditions were respiratory disorders (38.8%), musculoskeletal disorders (14.0%), and skin disorders (13.2%).

Limitations of data.

Although the Disaster Medical Assistance Team was on the scene 7 days after the tsunami, the seriously injured patients had already been evacuated and transferred. Most of the patients who visited the clinic had only minor medical problems. The trauma data is not broken down into any categories.

Data source	Data rating disease	Data rating trauma	Time bracket	Date entered	Analyst
1	3	5	Collected between 1 and 2 weeks after event	Not yet entered	Trevor Elkins

References.

1. Kwak, Y.H., Shin, S.D., Kim, K.S., Kwon, W.Y., & Suh, G.J. (2006). Experience of a Korean Disaster Medical Assistance Team in Sri Lanka after the South Asia tsunami. *Journal of Korean Medical Science*, *21*(1), 143–150.

Tsunami Event on the Island of Nias, Indonesia

Location(s): Sub-districts of Hiliduho, Lotu, Namohalu, Tuhumberua, and Afulu on the island of Nias, Indonesia.

Date(s): March 28, 2005.

Population affected: The sub-districts reporting had a combined population of 103,500.

Type of medical facility reporting data: Mobile clinics.

Description of data.

Clinics were set up in the sub-districts within a week of the disaster. However, the available data comes approximately 9 weeks after the event. There were 2,797 disease records and 23 trauma records. The disease records were classified as data rating Level 2 and the trauma records were classified as data rating Level 3. Both sets of data were broken down into five age groups: less than 1 month, between 1 month and 1 year, between 1 year and 5 years, between 6 years and 15 years, and greater than 15 years. The oldest two age groups were further divided into male and female. The top three disease conditions were respiratory disorders (34.7%), musculoskeletal disorders (13.2%), and gastrointestinal disorders (12.8%). The disease data is the most specific of any of the tsunami data sets that were gathered. Only 0.8% of the data was reported as trauma.

Limitations of data.

The data that was reported came approximately 9 weeks after the event. The trauma data is very limited and it is mostly classified as open wounds.

Data source	Data rating disease	Data rating trauma	Time bracket	Date entered	Analyst
1	2	3	Collected 9 weeks after event	Jan 2011	Trevor Elkins

References.

1. International Medical Corps data set.

Tsunami event caused by the Japan Sea Coast Earthquake

Location(s): The Aomori and Akita Prefectures of Japan.

Date(s): May 26, 1983

Population affected: There were 104 people were killed and 318 were injured.

Type of medical facility reporting data: Not reported.

Description of data.

This is a small set of data describing only injuries from a tsunami that struck the west coast of the island of Honshu in 1983. A total of 318 injuries were reported in the article. This data was classified as data rating Level 3. The top three trauma categories were superficial/contusions (43.4%), internal injuries (15.4%), and fractures (7.9%). The data is also classified by severity of injury. Major injuries made up 9.8% of the data, moderate injuries were 29.1% of the data, and minor injuries were 61.1% of the data.

Limitations of data.

The data is only concerned with traumas from the tsunami. It is stated in the article that while the majority of injuries were caused by the tsunami, a small portion were caused by the earthquake. It is not stated how long after the tsunami, or at what type of facility.

Data source	Data rating disease	Data rating trauma	Time bracket	Date entered	Analyst
1	No disease data	3	Collection date not provided	Not yet entered	Trevor Elkins

References.

1. Kaneda, M. (1994). Injury distributions produced by natural disasters. *Asian Medical Journal*, *37*(10): 557–563.

Tsunami Event Caused by the Indian Ocean Tsunami

Location(s): Thailand, at hospitals in Phang-Nga, Takuapa, and Surat Thani.

Date(s): December 26, 2004.

Population affected: Southern provinces of Thailand consisted of 270 sub-districts and 1,978 villages, with 574,845 households. Up to 70% of the sub-districts and 30% of the villages suffered from the disaster.

Type of medical facility reporting data: Hospitals.

Description of data.

This is a set of data coming from Thailand following the Indian Ocean tsunami event in 2004. In the article there were 1,328 injuries reported from three hospitals. This data was classified as data rating Level 3. The top three trauma categories were open wounds (44.1%), superficial/contusions (42.1%), and fractures (10.0%). The data was collected from the time of the disaster to 5 days out from the disaster.

Limitations of data.

The data is only concerned with traumas from the tsunami. Disease data was not reported in the article.

Data source	Data rating disease	Data rating trauma	Time bracket	Date entered	Analyst
1	No disease data	3	Collection date not provided	Not yet entered	Trevor Elkins

References.

1. Prasartritha, T., Tungsiripat, R., & Warachit, P. (2008). The revisit of 2004 tsunami in Thailand: characteristics of wounds. *International Wound Journal*, *5*, 8–19.

Table 7

Tsunami, Subject Matter Expert (SME) Adjusted - Trauma

ICD categories	Change justification	Current PCOF tables	SME adjusted
	Trauma		
Fractures	Not much data but fractures appear to be about half of open wounds	10.0%	25.0%
Open wounds	This is typically the highest occurring category	44.1%	50.0%
Amputations	Non-zero	0.0%	0.5%
Intracranial injuries	Typically low	0.0%	1.0%
Crush injuries	Low, but debris can cause crushing injuries	0.0%	2.0%
Burns	Typically low	0.0%	1.0%
Internal injuries	Typically low	1.0%	1.5%
Superficial/contusions	Typically the 3rd highest occurring category, some articles have the percentage higher	42.1%	10.0%
Dislocations	Low, but data for dislocation occasionally shows up in articles	0.9%	3.0%
Sprains/strains	Low, but data for sprains/strains occasionally shows up in articles	0.0%	3.0%
Insect bites	Non-zero	0.0%	0.5%
Heat and cold	Non-zero	0.0%	0.5%
Other trauma and injury	Typically low, unsure if data listed as other matches what we list as other	1.9%	2.0%

Table 8

Tsunami SME Adjusted – Disease

ICD-9 categories	Change justification	Current PCOF tables	SME adjusted
	Disease		
Nervous system disorders	Most data has it around 3–3.5%, but the Nias, Indonesia dataset had as high as 10.7%	3.2%	4.0%
Eye disorders	Mostly around 0%, Sri Lanka data had it at 2.5%	2.5%	1.5%
Ear disorders	Mostly around 0%, Sri Lanka data had it at 2.5%	2.5%	1.5%
Dental and oral disorders	Non-zero	0.0%	0.5%
Respiratory disorders	Data had a wide range from 13–42%, respiratory disorders decrease with time	38.8%	36.0%

ICD-9 categories	Change justification	Current PCOF tables	SME adjusted
Gastrointestinal disorder	Sri Lanka data only at 6.3%, higher in other data ranging from 10–17%	6.3%	12.0%
Genitourinary disorders	Between 0–2%, there was outlier data at 20.9% from Banda Aceh weeks after tsunami	1.4%	1.5%
Cardiovascular disorders	At 5% in Sri Lanka data, lower in other data sets	5.0%	3.0%
Musculoskeletal disorders	Most data around 13–14%, musculoskeletal disorder decrease with time	14.0%	13.5%
Skin disorders	Mostly between 12–14%, seems to decrease slightly with time	13.5%	12.5%
Infectious diseases	Between 0–2.3%, Banda Aceh dataset from 3 weeks out had it at 9.3%	2.1%	2.5%
General symptoms	Data ranges from 0.6–13.8%, picked a middle value	5.8%	6.0%
Metabolism disorders	Typically low, between 0–3%	2.5%	1.5%
Nutritional disorders	Non-zero	0.0%	0.5%
Obstetric/gynecological disorders	Typically low, Banda Aceh data was an outlier with it at 8.7%	0.6%	1.0%
Mental disorder	Typically low, Banda Aceh data from 3 weeks out had it at 10.7%	1.2%	2.0%
Neoplasm	Non-zero	0.5%	0.5%
	Trauma		
Fractures	Not much data but fractures appear to be about half of open wounds	7.9%	25.0%
Open wounds	This is typically the highest occurring category	6.6%	50.0%
Amputations	Non-zero	0.0%	0.5%
Intracranial injuries	Typically low	0.0%	1.0%
Crush injuries	Low, but debris can cause crushing injuries	0.0%	2.0%
Burns	Typically low	2.8%	1.0%
Internal injuries	Typically low	15.4%	1.5%
Superficial/contusions	Typically the 3rd highest occurring category, some articles have the percentage higher	43.4%	10.0%
Dislocations	Low, but data for dislocation occasionally shows up in articles	0.3%	3.0%
Sprains/strains	Low, but data for sprains/strains occasionally shows up in articles	4.7%	3.0%
Insect bites	Non-zero	0.0%	0.5%
Heat and cold	Non-zero	0.0%	0.5%
Other trauma and injury	Typically low, unsure if data listed as other matches what we list as other	18.9%	2.0%

Tsunami import.

The table below is the result of our literature review; it is the import used to populate tsunami data in the PCOF tool.

Tsunami disease conditions	Frequency
Respiratory disorders	1,042
Musculoskeletal disorders	377

Skin disorders	363
Open wounds	252
Superficial/Contusions	241
Gastrointestinal disorder	169
General symptoms	157
Cardiovascular disorders	134
Nervous system disorders	86
Ear disorders	68
Eye disorders	68
Metabolism disorders	66
Fractures	57
Infectious disease	57
Genitourinary disorders	37
Mental disorder	32
Obstetric/gynecological disorders	15
Neoplasm	13
Other trauma and injury	11
Internal Injuries	6
Dislocations	5
Amputations	0
Burns	0
Crush Injuries	0
Dental and oral disorders	0
Heat and cold	0
Insect bites	0
Intracranial Injuries	0
Nutritional disorders	0
Sprains/strains	0

Appendix D
Disaster Relief—Earthquakes

Haiti 2010 Earthquake

Location(s): Epicenter 16 miles west of Port au Prince, Haiti.

Date(s): January 12, 2010, 16:53 local time (21:53 UTC); 7.0 on the Richter magnitude scale.

Population affected: An estimated 3 million people were affected by the quake; an estimated 222,570 people were killed, 300,000 people were injured and 1 million made homeless. The government of Haiti also estimated that 250,000 residences and 30,000 commercial buildings had collapsed or were severely damaged.

Type of medical facility reporting data: Reports were available from: (a) Handicap International, providing rehabilitation services at 17 hospitals in the Port au Prince and neighboring areas; (b) a field hospital set up by University of Miami Global Institute/Project Medishare; (c) the Israeli Defense Forces Medical Corps Field Hospital; and (d) 51 hospital and clinic surveillance sites affiliated with the U.S. President's Emergency Plan for AIDS Relief (PEPFAR).

Description of data.

According to O'Connell et al. (2010), Handicap International rehabilitation professionals visited 17 hospitals in the Port au Prince area, including Carrefour area (epicenter), Canape Vert, Tabarre, Petionville, Kenscoff, and Petit Goave. These assessments took place between January 15–29, 2010, with many sites visited on multiple occasions. Hospitals included public, field, and private hospitals. Analysis was based on 282 direct patient assessments in hospital settings. The Handicap International team focused on persons with injuries requiring urgent post-injury or post-operative rehabilitation care to prevent secondary complications and maximize functional recovery. Thus, the data cannot be interpreted as representing all injuries sustained in the earthquake (i.e., minor wounds, small injuries etc). Gender breakdown was 148 (52%) males and 134 (48%) females. The majority (65%) of injured patients were in the 18–59 age group, with children under 5 years old and adults 60 years and over comprising 7% and 8% respectively of injured patients. Approximately 80–90% of hospital admissions in the 1st week following the earthquake were orthopedic traumas; the majority of orthopedic injuries were to the lower extremities, including the pelvis. Injury type breakdown was 156 (51%) fractures, 107 (35%) amputations, 19 (6%) spinal cord injuries, nine (3%) traumatic brain injuries, 5(2%) burns, and 11 (4%) other injuries. Breakdown of fractures were 94 (60%) lower limb, 12 (8%) upper limb, 2(1%) pelvis, and 49 (31%) unspecified. Amputations were further broken down into the following subcategories: 27 (25%) below knee, 46 (43%) above knee, 17 (16%) upper limb, and 17 (16%) unspecified.

Hortz et al. (2011) describe the experience of the first field hospital established after the earthquake by the University of Miami Global Institute/Project Medishare (UMGI/PM). UMGI/PM conducted a retrospective medical record review of all available inpatient records for the period January 13–May 28, 2010. Of 1,369 admissions, injury-related diagnoses were recorded for 581 (42%) patients, of whom 346 (60%) required a surgical procedure. Injury diagnoses breakdown was 88 (54.3%) fractures/dislocations,

60 (37%) wound infections, 15 (9.3%) head, face, and brain injuries, three (1.9%) burns, 41 (25.3%) crush injuries, and 69 (42.6%) other injuries. The breakdown for surgical procedures for injured patients were 76 (46.9%) wound debridement/skin grafting, 42 (25.9%) orthopedic trauma, 21 (13%) amputation, nine (5.6%) neurologic and spine, and four (2.5%) other procedures. Among patient records with documented injury-related mechanisms, 162 (28%) indicated earthquake-related injuries. Among all injured patients, 333 (57%) were male, and median age was 24 years (range: 1 day–96 years). Patients aged 15–24 years accounted for 22% of patients, more than any other 10-year age group. The majority of earthquake-related injured patients sought care during the first 4 weeks of the response, after which an increase in the proportion of patients with "injury other" was observed. During the study period, 788 (58%) inpatients had only non-injury-related diagnoses, of which the most common included infectious diseases followed by cardiac/respiratory conditions.

Kreiss et al. (2010) report on the experience of the Israel Defense Forces Medical Corps field hospital that was operational on site only 89 hours after the earthquake struck. During the 10 days, the hospital was operational. Its staff treated 1,111 patients, hospitalized 737 patients, and performed 244 surgical procedures on 203 patients. Based on available data for the 1,111 patients, 459 (44%) were male and 582 (56%) were female. The age breakdown was 112 (11.4%) 0–2 years, 251 (25.5%) 3–18 years, 574 (58.4%) 19–50 years, and 46 (4.7%) over 50 years. Trauma accounted for 66% of the admissions, with approximately 80% of the patients seen in the first 3 days considered trauma patients. Based on available trauma data (*n* = 1,041 patients), 265 (38.74%) had fractures, 188 (27.49%) had open wounds, 120 (17.54%) had superficial injuries, 107 (15.64%) had crush injuries, 89 (13.01%) had contusions with intact skin surface, 16 (2.34%) had burns, 12 (1.75%) had dislocations, 12 (1.75%) had internal injuries of the chest, abdomen, and pelvis, 11 (1.61%) had sprains and strains of joints and adjacent muscles, and eight (1.17%) had intracranial injuries (including skull fracture).

Finally, Magloire et al. (2010) report on the National Sentinel Site Surveillance launched within 2 weeks of the earthquake disaster. Fifty-one hospital and clinic surveillance sites affiliated with PEPFAR were selected to report daily counts by e-mail or telephone for 25 specified reportable conditions. During January 25–April 24, 2010, 42,361 persons had a reportable condition; of these, 54.5% were female, and 32.6% were aged <5 years. Nationally, the three most frequently reported specified conditions were acute respiratory infection (16.3%), suspected malaria (10.3%), and fever of unknown cause (10.0%). Injuries accounted for 12.0% of reported conditions. No epidemics or disease clusters were detected. The detailed breakdowns for infectious diseases, noninfectious diseases, and injuries are shown below.

Table 9
PEPFAR Earthquake Encounter

Category	*n*	Percent
Fever of unknown cause	4,240	10.00%
Suspected malaria	4,366	10.3
Suspected dengue fever	40	10.00%
Acute hemorrhagic fever syndrome	181	40.00%
Acute watery diarrhea	3,935	9.30%
Acute bloody diarrhea	600	1.40%

Category	*n*	Percent
Suspected typhoid fever	1,601	3.80%
Acute respiratory infection	6,910	16.30%
Suspected measles (fever and rash)	20	10.00%
Tuberculosis	499	1.20%
Tetanus	22	10.00%
Infectious (total):	22,414	52.90%
Acute malnutrition	1,028	2.40%
Skin disorder	2,662	6.30%
Renal failure	11	0.10%
Pregnancy complications	507	1.20%
Mental/psychological health	416	1.00%
Other chronic diseases	1,040	2.50%
Noninfectious (total)	5,664	13.40%
Trauma	1,148	2.70%
Fracture	467	1.10%
Cerebral concussion from head injury	27	0.01%
Lacerations from weapon or dagger injury	111	0.30%
Burns	149	0.40%
Wounds (infected)	3,061	7.20%
Crush injury syndrome	88	0.20%
Amputation	14	0.10%
Injuries (total)	5,065	12.00%
Other, not specified (total)	9,218	21.80%

Limitations of data.

These data were limited because individual patient encounter records were not available. Our knowledge of the injuries sustained is limited to what the authors reported in the studies.

Data source	Data rating	Time bracket
1	3	2
2	3	1
3	3	2
4	3	2

References.

1. O'Connell, C., Shivji, A., & Calvot, T. (2010). Preliminary findings about persons with injuries, Greater Port au Prince Area, 15–26 January, 2010. Handicap International Report, Compiled 29 January 2010.

2. Hortz,G., Ginzburg,E., Wurm,G., DeGannaro,V., Andrews,D., Basavaraju,S., . . . Selent, M. (2011). Post-earthquake injuries treated at a field hospital–Haiti, 2010. *Morbidity and Mortality Weekly Report (MMWR), 59*(51 & 52), 1673–1677.

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Pakistan Earthquake

Location(s): Muzafferabad of Kashmir, Pakistan.

Date(s): 8 October 2005, 8:52 am

Population affected: The earthquake occurred in the Muzafferabad area of Pakistan resulting in over 86,000 deaths and over 69,000 injuries. The destruction left approximately 3 million people homeless and disrupted local hospitals services.

Type of medical facility reporting data: Reports were available from three field hospital facilities (Turkish Red Crescent, Red Cross, and military) and one local hospital.

Description of data.

A Turkish Red Crescent field hospital treated 2,892 patients between 14 and 31 October 2005. Musculoskeletal injury (37%) was the most common reason for seeking treatment followed by respiratory tract disorders (15%). Other diagnoses included gastrointestinal disorders (11%), soft tissue infections (9.5%), skin disorders (9%), urinary tract disorders (7%), and cardiovascular disorders (4%). The 30–60 year old age group made up the largest proportion of musculoskeletal injuries followed by the under 15 years of age group. Only 5.86% of the musculoskeletal injuries were open fractures and 2.3% of the orthopedic patients had infections. Pelvic fractures, tibia fractures, and hand and wrist fractures occurred at the same frequency of 45. Femur fractures and vertebra fractures were similar; 42 and 41 respectively.

An International Committee of the Red Cross field hospital operated in Muzaffarabad from 21 October to 10 November 2005 and treated 316 patients. Almost half of these patients were children under the age of 14 and one third of the patients were women. Fracture was the most common type of injury seen (47.8%) and the lower extremity was the most common anatomical site. The authors note that most of their patients needed surgical intervention, and that at the end of their 3-week operation, non-surgical cases started to increase.

A Pakistani military field hospital, located in Forward Kahuta, triaged 1,502 patients with 486 requiring hospitalization in the first 72 hours following the earthquake. Superficial lacerations were the most common injury treated (64.9%) followed by fractures (22.2%) and soft tissue bruising or sprains (5.9%).

The most common anatomical sites for laceration were the face, scalp, and back. The majority of extremity injuries occurred in the lower extremity.

The final study is from the Emergency Relief Hospital in Doraha, Masehra. Sami et al. (2009) reviewed 310 randomly selected records of the 1,700 patients registered at the hospital between 13 and 23 October 2005. The majority of the patients treated were female and 63% of the patients were 30 years of age or younger. Children under 10 made up the largest age group. The authors classified the injuries as bone injuries, soft tissue injuries, or mixed injuries. Bone injuries were the most common injury type (41%) with lower limb fractures accounting for over half of the bone injuries. Soft tissue injuries were present in 36% of patients and mixed injuries in 23% of patient.

Limitations of data.

These data were limited because individual patient encounter records were not available. Our knowledge of the injuries sustained is limited to what the authors reported.

Data source	Data rating	Time bracket
1	–	2
2	2	2
3	–	1

References.

1. Bozkurt, M., Ocguder, A., Turktas, U., & Erdem, M. (2007). The evaluation of trauma patients in Turkish Red Crescent field hospital following the Pakistan earthquake in 2005. *Injury-International Journal of the Care of the Injured, 38*, 290–297.

2. Helminen, M., Saarela, E., & Salmela, J. (2006). Characterisation of patients treated at the Red Cross field hospital in Kashmir during the first 3 weeks of operation. *Emergency Medicine Journal, 23*,654–656.

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4. Sami, F., Ali, F., Zaidi, S. H. H., Rehman, H., Ahmad, T., & Siddiqui, M.I. (2009). The October 2005 earthquake in northern Pakistan: Pattern of injuries in victims brought to the emergency relief hospital, Doraha, Mansehra. *Prehospital and Disaster Medicine, 24*(6), 535–539.

Wenchuan, Sichuan, China Earthquake 2008

Location(s): Wenchuan in the Province of Sichuan, China.

Date(s): May 12, 2008, 2:28PM 7.3 magnitude.

Population affected: The earthquake caused disruption of local services such as electricity, water, communication systems, and destroyed many buildings, including schools, power plants, and

hospitals. It is estimated that 70,000 deaths and 370,000 injuries occurred because of this disaster. Estimates of the economic loss run higher than U.S. $75 billion, making it one of the costliest natural disasters in China's history.

Type of medical facility reporting data: Reports were available from three different studies. Chan and Kim (2010) conduct a descriptive cross-sectional study in an emergency triage clinic in Sichuan. Liang et al. (2009) analyze cross-sectional data of maxillofacial injuries using hospital-based records of survivors admitted to the West China Hospital of Stomatology. Finally, Jia et al. (2010) report on head injuries of survivors from the neurosurgery departments of major hospitals in Sichuan.

Description of data.

According to Chan and Kim (2010), among the 132 patients (73% of total 182 evacuees) who required clinical management onsite at an emergency triage clinic, 54% of patients required trauma/surgical management and 46% patients had nonsurgical-related clinical needs. Trauma pattern analysis showed that 12% had trauma injury in multiple sites and that the extremities (12%) were the most common site for trauma injury. Patients who required chronic noncommunicable disease management represented 30% of the clinical burden. The study concludes that while it is important to address acute trauma during the emergency phase post earthquake, chronic clinical needs may constitute a significant proportion of emergency care needs in low- to middle-income settings in China.

Liang et al. (2009) describe the pattern of maxillofacial injuries sustained by 113 survivors of the earthquake in the West China Hospital of Stomatology from May 12 to June 23, 2008. Cross-sectional data were analyzed using hospital-based records of earthquake survivors. The age of earthquake survivors of maxillofacial injuries ranged from 4 to 84 years. Of the 113 survivors, 72 (63.7%) were male and 41 (36.3%) were female. Mean ages were 43 years for male and 41 years for females. More than 69% of survivors were 20 to 59 years old. The most frequently examined sites were the cheeks (32.8%), mandibular area (24.8%), and maxillary area (14.4%). Fractures (40.7%) and soft tissue injuries (38.9%) were the most common of all injuries in the maxillofacial region. Thirteen (11.5%) patients had dental injuries and nine (8.0%) also had other organ injuries. The study concludes that the incidence of maxillofacial injuries in survivors was relatively low compared with injury in other organs. However, because most injuries were maxillofacial fractures and facial soft tissue damage, special attention was paid to maxillofacial injury when planning and providing emergency treatment.

Finally, Jia et al. (2010) retrospectively analyze clinical features of head injuries based on patient records from departments of neurosurgery in major hospitals in Sichuan province. Examined were 1,368 patient records with head injuries from May 12 to June 12, 2008. Of the 1,368 patients, 755 (55%) were male and 613 (45%) were female. There were 657 (48%) patients who sustained an open cranial injury and 234 (17%) sustained an open CCI. Based on the Glasgow Coma Scale, the injuries were classified as mild in 966 (71%) patients, moderate in 239 (17%) patients, and severe in 163 (12%) patients. Cerebral herniation was observed in 42 (3%) patients. Discussing clinical types, scalp injury was found in 891 (65%) patients, calvarial fracture in 382 (28%) patients, skull base fracture in 153 (11%) patients, and intracranial hematoma in 140 (10%) patients. Further, 18 (1%) patients had traumatic subarachnoid hemorrhage, 53 (4%) had cerebral concussion, 155 (11%) had contusion and laceration, 47(3%) had

diffuse axonal injury, and 25(2%) had primary brain-stem injury. The main concomitant injury was bone fracture found in 286 (21%) patients. Other concomitant injuries were limb fracture in 202 (15%) patients, spine fracture in 20 (1%) patients, pelvic fracture in 41 (3%) patient, and rib fracture in 23 (2%) patients. There were 68 (5%) patients with thoracic injury, 32 (2%) patients with abdominal injury, and 69 (5%) patients with crush injury. Maxillofacial trauma was found in 67 (5%) patients and shock occurred in 36 (3%) patients. Discussing complications, wound infection of the head was noted in 118 (9%) patients, lung infection in 49 (4%) patients, post-traumatic seizures in 25 (2%) patients, and acute renal failure in 29 (2%) patients. In previous studies, earthquake related injuries were mainly skeletal injuries followed by cranial injuries, which constituted 15–40% of total injuries. In the Sichuan earthquake, cranial injuries accounted for 11% of the earthquake related injuries in different hospitals.

Limitations of data.

The referenced literature analyzed specific categories of injuries rather than overall patient injury and disease distribution. Individual patient encounter records were not available.

Data source	Data rating	Time bracket
1	3	1
2	5	1
3	5	1

References.

1. Chan, E., & Kim, J. (2011). Chronic health needs immediately after natural disasters in middle-income countries: the case of the 2008 Sichuan China earthquake. *European Journal of Emergency Medicine, 18*(2):111-4. doi: 10.1097/MEJ.0b013e32833dba19.

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3. Jia, L., Li, G., You, C., Li, H., Huang, S., Yang, C., . . . Zeng, Y. (2010). The epidemiology and clinical management of craniocerebral injury caused by the Sichuan earthquake. *Neurology India, 58*(1), 85–89.

Bam Iran Earthquake

Location(s): Bam in the Province of Kerman, Iran; southeastern Iran.

Date(s): December 26, 2003, 5:26 am.

Population affected: The earthquake caused disruption of local services such as electricity, water, communication systems, and destroyed many buildings, including hospitals and clinics. It is estimated that 40,000 deaths and 30,000 injuries occurred because of this disaster.

Type of medical facility reporting data: Four different retrospective studies from referral hospitals in Tehran have been published. According to the published articles, approximately 12,000 patients

were transferred to tertiary care facilities throughout Iran following the earthquake in Bam since practically all healthcare facilities there were destroyed. Naghi et al. (2005) report on injuries from 210 patients admitted to the Shariati Hospital, Mohebbi et al. (2008) report on injuries from 854 patients transferred to 12 hospitals in Tehran, and Sabzehchian et al. (2006) focus on the injuries sustained by the pediatric population. A study detailing the orthopedic injuries seen at the hospitals of Shaheed Beheshti University of Medical Sciences is also included (Kazemian et al., 2004).

Description of data.

According to Mohebbi et al. (2008), approximately 2,700 individuals were admitted among 12 referral hospitals in Tehran. A review of 854 records of individuals with earthquake-related injuries revealed the majority of patients were male (54.7%) and 1,322 injuries were treated. Lower extremity fractures were the most common injury (39%). The face and spine were other common sites of fractures. Soft tissue injuries most commonly occurred in the lower extremity followed by injuries to the head and neck region. Soft tissue injuries included lacerations, muscular damage, and neural and vascular injuries (Mohebbi et al., 2008).

Injured patients were also admitted to the Tehran University of Medical Sciences hospitals. Naghi et al. (2005) report on the musculoskeletal injuries of 210 such patients. Fractures were the most common injury type with more occurring in the lower extremity (45% of fractures) than the upper extremity (20% of fractures). Pelvic fractures (29%) and vertebral fractures (10%) were common. Other injuries noted include: intracranial injuries, superficial injuries to the head, thoracic injuries, and abdominal injuries. Kazemian et al. (2004) also describe musculoskeletal injuries seen at other University of Medical Sciences hospitals. Of the 104 patients included in the study, 76.9% had an orthopedic injury. Pelvic fractures accounted for 25% of the fractures. Fractures of the lower extremity were second in the order of prevalence. By far, the most common fracture in the lower extremity was to the bones in the lower leg followed by fracture of the femur. Distal radial fractures were the most prevalent orthopedic injury in the upper extremity, followed closely by fractures to the hand and fracture of the humerus.

Finally, Sabzehchian et al. (2006) describe the injuries of 119 pediatric patients seen at three referral hospitals in Tehran. Extremity injuries were noted in 69.7% of patients, head and spinal injuries in 32.7% of patients, and chest and abdominal injuries in 14.2% of patients. The lower extremity injuries were more common than upper extremity injuries and included lacerations (23%), fractures (21%), joint injury (20.5%), ecchymosis (12.7%), deep wound (9%), hematoma (8%), and vascular (5%) injuries.

Limitations of data.

Data source	Data rating	Time bracket
1	5	1
2	2	1
3	2	1
4	5	1

References.

1. Kazemian, G., Azarbal, M., Enami, M., Khatibi, H., Ebrahimpour, A., Shafaghi, T., . . . Adybeik, D. (2004). Orthopedic injuries in the victims of the earthquake of Bam. *The Internet Journal of Orthopedic Surgery, 2*(1). DOI: 10.5580/509

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3. Naghi, T. M., Kambiz, K., Shahriar, J. M., Afshin, T., Reza, S. K., Behnam, P., & Bahador, A. H. (2005). Musculoskeletal injuries associated with earthquake; A report of injuries of Iran's December 26, 2003 Bam earthquake casualties managed in tertiary referral centers. *Injury-International Journal of the Care of the Injured, 36*, 27–32.

4. Sabzehchian, M., Abolghasemi ,H., Radfar, M. H., Jonaidi-Jafari, N., Ghasemzadeh, H., & Burkle, F. M. (2006). Pediatric trauma at tertiary-levels hospital in the aftermath of the Bam, Iran earthquake. *Prehospital and Disaster Medicine, 21*(5), 336–339.

Marmara Turkey Earthquake

Location(s): Marmara region of Turkey.

Date(s): August 17, 1999; 3:04 am.

Population affected: Estimates vary but approximately 50,000 people were injured and 17,500 were killed. The Marmara region is densely populated and includes cities such as Bursa, Izmit, Adapazari, and Istanbul.

Type of medical facility reporting data: The published data associated with this event comes from a local hospital, the Israeli Defense Force (IDF) field hospital, as well as retrospective studies looking at subset populations and their associated injuries.

Description of data.

The local hospital in Bursa examined the records of 330 admitted patients. The patient conditions fell into three main categories: crush syndrome, vital organ injuries, and non-traumatic but earthquake related illness. Two-thirds of the patients had an extremity injury such as a fracture, dislocation, or an injury to the soft tissue. Approximately 32% of the extremity injuries were lower extremity fractures, 7.3% were upper extremity, and 1.7% were dislocations. Besides the extremities, common anatomical sites for injuries included: spine, chest, abdomen, head, and pelvis. The majority (64.4%) of patients had injuries in only one system, 12.7% had injuries to multiple systems, and 23% had trauma and crush syndrome. The non-trauma patients admitted presented with conditions such as coronary syndrome, premature birth, meningitis, gastroenteritis, and neurological diseases (Bulut et al., 2004).

The IDF field hospital arrived on day 4 after the earthquake and treated 1,205 patients in the 10 days following arrival. The field hospital was set up in Adapazari, a major city in the region with 400,000

citizens. In the first 3 days of the operation, the hospital saw trauma patients, pediatric patients, and patients requiring treatment by internal medicine specialists. It is speculated that heat, stress, and physical activity caused food-borne illness, dehydration, and certain skin disorders. Days 6–8 showed an increase in respiratory diseases such as asthma, pneumonia, and pulmonary edema. Patients with exacerbated chronic illness also presented. The chronic conditions included: diabetes, myocardial infarction, ketoacidosis, hypertension, and asthma. The frequency distribution of patients treated by medical specialty are: internal medicine 32%, general surgery 13%, orthopedic surgery 21%, pediatric diseases 23%, obstetrics and gynecology 10%, and psychiatric disorders 1% (Bar-Dayan et al., 2000).

The subset data for the Marmara earthquake focus on chest and lung injuries and extremity injuries in children. There were 21 patients with lung and thorax injuries. The most common chest injury in hospitalized patients was pneumothorax, followed by hemothorax and rib fracture. Four patients developed acute respiratory distress syndrome, three patients had pneumonia, and one patient had a pulmonary embolism (Ozdogan, S., Hocaoglu, A., Caglayan, B., Imamoglu, Ou., & Aydin, D., 2001). According to Sarisozen and Durak (2003), of the 151 patients hospitalized with musculoskeletal trauma, 31 were children under the age of 16. The majority of the children with musculoskeletal trauma had crush syndrome involving the lower extremities.

Limitations of data.

The limitations of the data available for the Marmara Earthquake were the lack of frequency data for the specific conditions seen by the IDF and the local hospital. The data were reported by medical specialty treating the patients or by type of injury and/or anatomical location.

Data source	Data rating	Time bracket
1	2	2
2	4	2
3	5	1
4	5	1

References.

1. Bulut, M., Fedakar, R., Akkose, S., Akgoz, S., Ozguc, H., & Tokyay, R. (2005). Medical experience of a university hospital in Turkey after the 1999 Marmara earthquake. *Emergency Medicine Journal, 22*, 494–498.

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Table 10
Earthquake Subject Matter Expert (SME) Adjusted

ICD-9 categories	Change justification	Current PCOF tables	SME adjusted
	Disease		
Nervous system disorders	Non-zero	0.0%	0.5%
Eye disorders	Non-zero	0.0%	0.5%
Ear disorders	Non-zero	0.0%	0.5%
Dental and oral disorders	Non-zero	0.0%	0.5%
Respiratory disorders	Range in Pakistan and Haiti goes from 24 to 30%	7.6%	25.0%
Gastrointestinal disorder	Range in Pakistan and Haiti goes from 16 to 26%	21.0%	16.0%
Genitourinary disorders	In Haiti tent cities 12%, in Pakistan 13.4%	0.0%	10.0%
Cardiovascular disorders	Data from Haiti tent cities	0.0%	6.0%
Musculoskeletal disorders	In Haiti tent cities 3.5% of muscle, joint, and bone pain	0.0%	3.0%
Skin disorders	Same as in Haiti surveillance data	11.2%	11.0%
Infectious diseases	Number of infectious disease may be high due to Location	32.6%	8.0%
General symptoms	Reduced from Haiti surveillance data	20.1%	11.0%
Metabolism disorders	Non-zero and greater than .5 because diabetes is common worldwide	0.0%	1.0%
Nutritional disorders	From Haiti surveillance data	3.9%	3.0%
Obstetric/gynecological disorders	From Haiti surveillance data	1.9%	2.0%
Mental disorder	From Haiti surveillance data	1.6%	2.0%
Neoplasm		0.00	
	Traumas		
Fractures	Reduced from Haiti surveillance data	10.1%	50.0%
Open wounds	Reduced from Haiti surveillance data	66.5%	30.0%
Amputations	Slightly increased since surveillance data from basic clinics and amputations would be seen at higher levels of care	0.2%	0.5%
Intracranial injuries	Haiti surveillance data	0.4%	0.5%
Crush injuries	Haiti surveillance data	1.3%	2.0%
Burns	Slight decrease on Haiti surveillance data	2.3%	2.0%
Internal injuries	Data from Turkey, Pakistan, Iran, and Haiti range from 1–8% most between 1–5%	0.0%	3.0%
Superficial/contusions	Slightly increased Haiti data based on complications from earthquakes article, data from other incidents varies widely	1.7%	5.0%
Dislocations	Data from IDF Haiti	0.0%	2.0%
Sprains/strains	Data from IDF Haiti	0.0%	2.0%
Insect bites	Non-zero	0.0%	0.5%
Heat and cold	Non-zero	0.0%	0.5%
Other trauma and injury	Reduced, made percentage more in line with nerve, blood vessel and spinal injuries since they are in this category	17.5%	2.0%

Earthquake import.

The table below is the result of our literature review; it is the import used to populate earthquake data in the PCOF tool.

Earthquake disease conditions	Frequency
Respiratory disorders	7,409
Infectious disease	6,230
General symptoms	5,280
Gastrointestinal disorder	4,535
Open wounds	3,061
Skin disorders	2,662
Other trauma and injury	1,148
Nutritional disorders	1,028
Obstetric/gynecological disorders	507
Fractures	467
Mental disorder	416
Burns	149
Superficial/contusions	111
Crush injuries	88
Intracranial injuries	27
Amputations	14
Genitourinary disorders	11
Cardiovascular disorders	0
Dental and oral disorders	0
Dislocations	0
Ear disorders	0
Eye disorders	0
Heat and cold	0
Insect bites	0
Internal Injuries	0
Metabolism disorders	0
Musculoskeletal disorders	0
Neoplasm	0
Nervous system disorders	0
Sprains/strains	0

Appendix E
Disaster Relief—Hurricane

Hurricane Katrina

Location(s): New Orleans

Date(s): Sep 2005

Population affected: The target population for the surveillance system was persons living or working in four parishes in and around New Orleans (i.e., Jefferson, Orleans, Plaquemines, and St. Bernard).

Type of medical facility reporting data: Evacuation Center and Health care Facilities.

During September 8–25, 2005, 7,508 events were recorded; 4,169 (55.6%) were illnesses, and 2,018 (26.9%) were injuries (Tables 1 and 2). Another 1,321 (17.5%) were non-acute health-related events, not classified as either illnesses or injuries (e.g., medication refills, wound checks, or cast removals). Of the 6,167 illnesses and injuries where disposition status was known, five persons died, and 552 (9%) were admitted to hospitals. Among those injured, 42 had intentional injuries (i.e., self-inflicted or violent), seven of those (16.7%) were victims of assault, and one (2.4%) was admitted to a health care facility. A total of 1,037 (13.8%) events were recorded for relief workers (e.g., paid military, paid civilian, or volunteer), and 2,567 (34.2%) events were recorded for residents (i.e., persons not identified as relief workers). For 3,904 (52.0%) persons, relief worker status or resident status was unknown. Relief workers were significantly more likely than residents aged >18 years to be treated in a nonhospital facility (odds ratio = 5.8, 95% confidence interval = 5.0–6.8).

The target population for the surveillance system was persons living or working in four parishes in and around New Orleans (i.e., Jefferson, Orleans, Plaquemines, and St. Bernard). On September 9, active surveillance was initiated in three hospitals and five nonhospital facilities that were providing acute care in these four parishes. Two additional hospitals and six additional nonhospital facilities in neighboring parishes that were treating workers and residents from the area also were enrolled in the surveillance system. As of September 25, four hospitals and 10 nonhospital facilities were participating in the surveillance system. Data were collected from 15 Emergency Departments, Disaster Medical Assistance Teams, and outpatient health care facilities in two phases, using two different systems. The number of facilities reporting varied daily; a maximum of 15 total facilities, including eight Disaster Medical Assistance Teams, were included in the reporting.

Description of data.

This study is a retrospective chart review of 465 patient visits from 02 September 2005 to 22 October 2005 at a post-Katrina clinic in New Orleans, Louisiana that was open for 7 weeks, providing urgent care services in the. Of 465 patients, 49.2% were middle-aged, 62.4% were men, 35% were relief workers, and 33.3% were evacuees; 35% of visits occurred in week 5. Of 580 chief complaints, 71% were illnesses, 21% were medication refill requests, and 8.5% were injuries. Emergency clinics likely served persons

with less severe conditions, whereas health care facilities likely served persons with acute and more severe conditions.

Table 11

Number and Percentage of Persons With Selected Illnesses After Hurricane Katrina, by Residency Status—New Orleans, Louisiana Area, September 8–25, 2005

Selected illnesses	Relief workers		Residents		Unknown		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Infectious disease related								
Skin or wound infection	101	19.1	192	12.8	347	16.2	640	15.4
Acute respiratory infection	119	22.5	158	10.5	228	10.6	505	12.1
Diarrhea	11	2.1	52	3.5	83	3.9	146	3.5
Other infectious disease	36	6.8	109	7.3	143	6.7	288	6.9
Noninfectious disease related								
Rash	67	12.7	87	5.8	146	6.8	300	7.2
Heat related	34	6.4	80	5.3	93	4.3	207	5.0
Non-diarrhea gastrointestinal	23	4.4	77	5.1	108	5.0	208	5.0
Renal*	8	1.5	44	2.9	35	1.6	87	2.1
Other classified illness†	22	4.2	52	3.5	88	4.1	162	3.9
Other illnesses	107	20.3	649	43.3	870	40.6	1,626	39.0
Total	528	100.0	1,500	100.0	2,141	100.0	4,169	100.0

* Includes kidney stones and renal failure (i.e., chronic and acute).

† Includes diabetes, cardiovascular conditions, obstetrics/gynecologic conditions, and dental problems.

Table 12

Number and Percentage of Persons With Selected Injuries and Exposures After Hurricane Katrina, by Residency Status—New Orleans, Louisiana Area, September 8–25, 2005

Selected injuries and exposures	Relief workers		Residents		Unknown		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Injuries								
Falls	46	13.6	196	27.4	222	23.0	464	23.0
Bites/stings	67	19.8	92	12.8	152	15.8	311	15.4
Motor vehicle crash	16	4.7	65	9.1	64	6.6	145	7.2
Intentional injury	4	1.2	20	2.8	18	1.9	42	2.1
Other unintentional injuries*	117	34.6	237	33.1	362	37.6	716	355
Undetermined etiology	72	21.3	99	13.8	128	13.3	299	14.8
Toxic exposure/poisoning								
Carbon monoxide poisoning	5	1.5	3	0.4	6	0.6	14	0.7
Other toxic exposure	11	3.3	4	0.6	12	1.2	27	1.3
Total	338	100.0	716	100.0	964	100.0	2,018	100.0

* Includes cuts, blunt trauma, burns, and environmental exposure.

Limitations of data.

The challenges associated with the Hurricane Katrina response underscore the importance of standardized surveillance that supports a collaborative and integrated approach to monitoring and reporting the health status of affected populations. To improve disaster-related national surveillance efforts, CDC has convened a workgroup to review data-collection methods and materials used during and after Hurricanes Katrina and Rita. The workgroup is developing standardized surveillance methods that can be adapted for individual and aggregate morbidity surveillance in different settings. The workgroup is collaborating with local and state health departments and national agencies responsible for mass care and housing (e.g., National Disaster Medical Service and American Red Cross). The workgroup will also develop and test the feasibility of using technologies such as hand-held devices and Internet-based reporting for data collection.

Hurricane Ivan: Grenada

Location(s): Grenada

Date(s): 07 September 2004 to 07 October 2004

Type of medical facility reporting data: Medical records from the surgery ward of Grenada General Hospital.

Description of data.

This was a retrospective study using medical records from the surgery ward of Grenada General Hospital, which is the main hospital in Grenada and has 200 beds. It was the only public health facility in the country that provided surgical hospital care. All patients admitted to the surgical ward in the month following Hurricane Ivan (07 September 2004 to 07 October 2004 were classified as the Assessment Group. As a Control Group, the records of patients admitted during the same period the previous year were used. The parameters examined were gender, age, length of hospitalization, and diagnosis. The patients were classified into seven groups, based on their primary diagnosis:

1. intra-abdominal diagnoses (e.g., appendicitis, cholelithiasis, hernia, urinary retention, renal colic);
2. blunt trauma (e.g., fracture, concussion);
3. lacerations;
4. infections due to wounds;
5. diabetic foot;
6. gunshot wounds; and
7. other causes.

Table 13
Group Classification

Diagnosis	Females 2003	Females 2004	Males 2003	Males 2004
Abdominal causes	20	6	39	18

Diagnosis	Females 2003	Females 2004	Males 2003	Males 2004
Diabetic foot	3	13	3	9
Gunshot wounds	0	0	0	7
Infection from wounds	5	8	2	16
Laceration	3	8	10	13
Blunt trauma	12	16	37	50
Other causes	15	9	18	11

Limitations of data.

This unique study of hurricane victims demonstrated that the medical needs of the victims following Hurricanes Andrew and Iniki were similar despite the fact that one hurricane struck Florida and the other struck Hawaii. This has important implications for disaster planners in that the medical needs of hurricane victims may be predictable.

Conclusion.

This unique study of hurricane victims demonstrated that the medical needs of the victims following Hurricanes Andrew and Iniki were similar despite the fact that one hurricane struck Florida and the other struck Hawaii. This has important implications for disaster planners in that the medical needs of hurricane victims may be predictable.

Hurricanes, subject matter expert (SME) adjusted.

A review of the baseline data for hurricane DR responses revealed deficiencies in the scope of disease related occurrence in the frequencies developed from the hurricane specific literature review. This resulted in a skew of those disease occurrence data captured in the literature. The analysis provided from the hurricane specific literature review yielded data for 10 (58%) of the 17 disease categories. Moreover, the respiratory disease category dominated the dataset resulting in a 46% estimate of respiratory conditions.

The data collected for trauma in the hurricane specific literature review was more robust. There were 13 categories for trauma and in this scenario only three (28%) did not have supporting occurrence data derived from the literature review.

To resolve these data deficiencies in the disease categories a literature review that went beyond the scope of the disease occurrences during hurricanes or cyclone was undertaken. The primary source of disease presentations for the SME adjusted PCOF tables came from National Health Statistics Report from Oct 2010. This report provided estimated data on hospital discharges from short-stay admissions in the United States in 2007. While exhaustive, there were still categories that needed SME adjustment. For instance, eye and ear disorders were not reported in the data, but data on diseases of the nervous system and sense organs were provided. Without having more detailed information, a uniform distribution was applied across the PCOF table categories of nervous system disorders, eye disorders,

and ear disorders. No data were found on the incidence of dental disorders or nutritional disorders; for these conditions, a nominal value of 0.5% was inserted.

To resolve the data deficiencies in the trauma categories, a literature review that went beyond the scope of the original study. This review served to supplement existing data for amputations, intracranial injuries, and internal injuries, not considered in previous reviews.

Limitations of data.

These data were not without limitations. The most striking feature of the data gathered from a review of the epidemiologic literature on tropical cyclones is its lack of uniformity. The absence of an international classification and coding scheme for recording injuries sustained in cyclones also makes planning medical assistance difficult following future cyclones and hurricanes.

The data gleaned to support changes in the disease category were from hospital discharge survey, and while the survey provides detailed information, it may not precisely match disease occurrence in an outpatient setting. Table 14 provides the change rationale, current PCOF tables, the discharge summary, the un-normalized PCOF table, and the new SME adjusted normalized PCOF tables.

Table 14
PCOF Table Change Rationale

Disease	Change rationale	Discharge summary	Current PCOF table	SME derived raw %	SME adjusted (normalized)
Disease					
* Nervous system disorders	Level 3 data	794	0.0%	1.3%	1.2%
* Eye disorders	subset nervous sys dis	–	0.0%	1.3%	1.2%
* Ear disorders	subset nervous sys dis	–	0.0%	1.3%	1.2%
Dental and oral disorders	Non-zero	–	0.0%	5.0%	4.5%
* Respiratory disorders	Level 3 data	3,300	46.0%	16.4%	14.9%
*Gastrointestinal disorder	Level 3 data	3,290	19.7%	16.3%	14.8%
* Genitourinary disorders	Level 3 data	2,092	0.0%	10.4%	9.4%
*Cardiovascular disorders	Level 3 data	349	0.8%	1.7%	1.6%
* Musculoskeletal disorders	Level 3 data	1,881	0.0%	9.3%	8.5%
* Skin disorders	Level 3 data	752	1.5%	3.7%	3.4%
* Infectious diseases	Level 3 data	1,215	13.3%	6.0%	5.5%
General symptoms	Level 3 data	188	0.0%	0.9%	0.8%
Metabolism disorders	Level 3 data	1,816	8.9%	9.0%	8.2%
Nutritional disorders	Non-zero	–	0.0%	5.0%	4.5%
* Obstetric/gynecological disorders	Level 3 data	498	0.0%	2.5%	2.2%
Mental disorder	Level 3 data	2,386	9.9%	11.8%	10.8%
* Neoplasm	Level 3 data	1,598	0.0%	7.9%	7.2%
Trauma/injury					
Fractures		–	9.9%	9.9%	8.8%
Open wounds		–	52.1%	52.1%	46.5%
** Amputations	Non-zero	–	0.0%	7.0%	6.2%

Disease	Change rationale	Discharge summary	Current PCOF table	SME derived raw %	SME adjusted (normalized)
** Intracranial injuries	Non-zero	–	0.0%	1.5%	1.3%
Crush injuries		–	4.2%	4.2%	3.8%
Burns		–	2.8%	2.8%	2.5%
** Internal injuries		–	0.0%	3.2%	2.9%
Superficial/contusions		–	13.0%	13.0%	11.6%
Dislocations		–	2.0%	2.0%	1.8%
Sprains/strains		–	8.8%	8.8%	7.8%
Insect bites		–	6.8%	6.8%	6.1%
Heat and cold	Non-zero	–	0.0%	0.5%	0.4%
Other trauma and injury		–	0.3%	0.3%	0.2%

* National Hospital Discharge Survey: 2007 Summary. Margaret Jean Hall, Ph.D.; Carol J. DeFrances, Ph.D.; Sonja N. Williams, M.P.H.; Aleksandr Golosinskiy, M.S.; and Alexander Schwartzman, Division of Health Care Statistics

** Analysis of Medical Needs During Disasters Caused by Tropical Cyclones: Anticipated Injury Patterns. Eric, K. Journal of Tropical Medicine and Hygiene 1993, 96, 370–376

Hurricane import.

The table below is the result of our literature review; it is the import used to populate hurricane data in the PCOF in the tool.

Hurricane disease conditions	Frequency
Open wounds	3,033
Respiratory disorders	1,901
Gastrointestinal disorder	814
Superficial/contusions	758
Fractures	577
Infectious disease	550
Sprains/strains	511
Mental disorder	407
Insect bites	395
Metabolism disorders	366
Crush injuries	247
Burns	165
Dislocations	115
Skin disorders	61
Cardiovascular disorders	31
Other trauma and injury	16
Nervous system disorders	0
Eye disorders	0
Ear disorders	0
Dental and oral disorders	0
Genitourinary disorders	0
Musculoskeletal disorders	0
General symptoms	0

Nutritional disorders	0
Obstetric/gynecological disorders	0
Neoplasm	0
Amputations	0
Intracranial injuries	0
Internal injuries	0
Heat and cold	0

Appendix F
Humanitarian Assistance

Pacific Partnership 2007

In the summer of 2007, the USS Peleliu (LHA-5) visited six Pacific-region countries as a part of the Navy's ongoing humanitarian assistance (HA) program named Pacific Partnership. The ship made stops in the Philippines, Vietnam, Papua New Guinea, Micronesia, Solomon Islands, and Marshall Islands. Acute medical care was provided ashore at each location. USS Peleliu mission data—consolidated from daily situation reports—are found in Table 15. These data include patients from medical, dental, optometry, and immunizations.

Table 15
USS Peleliu Patient Encounters

Location	No. patient encounters
Marshall Islands	11,956
Papua New Guinea	11,191
Philippines	10,642
Solomon Islands	5,201
Vietnam	4,310
Micronesia	2,034
Total	45,334

Medical providers performed surgeries in the Philippines, Papua New Guinea, Solomon Islands, and Marshall Islands. Summary surgical data are presented in Table 16. General, plastic, and ophthalmologic surgical services were offered. The most common surgical procedure was hernia repair. Hernia repair (39%) and subtotal thyroidectomy (25%) accounted for over half of the general surgical cases. Cataract surgery was performed on more than 50% of the eye surgical patients. Ptyergium and strabismus were other surgical eye procedures completed. Pediatric surgical cases were mainly hernia repair and cleft palate/cleft lip repair.

Table 16
USS Peleliu Surgical Cases

Surgical procedure	No. of patients
General	166
Eye	98
Pediatric	21

Plastics	16
Total	301

Capacity building activities included providing veterinary services, preventive medicine services, training, and medical equipment repair. A summary of the capacity building activities from Pacific Partnership 2007 is found in Table 17.

Table 17
Summary of Capacity Building Activities Conducted During Pacific Partnership 2007

Capacity building activity	Total
Veterinary patients	2,614
Veterinary immunizations	1,793
Students trained	5,547
Preventive medicine services	1,609
Medical equipment repair	83
Medical equipment evaluation	131

Medical, dental, and optometry services were documented on a patient encounter form that was to be entered into a database. The data were collected to inform future missions and better project the supplies needed for Navy HA missions. For ease of use, the patient encounter form had check boxes with common diagnoses organized by anatomical regions/organ systems. The provider also had the option to check a box labeled “other” if the patient’s diagnosis was not listed on the form. In the space after the box, the diagnosis could be hand written. Manually entering the data was extremely slow, so Naval Health Research Center used an optical character recognition software program to read and recognize the checked boxes on the form and populate a corresponding database. The data presented here are from the scanned patient encounter forms. Since the form was not originally developed with the intent to scan, the optical character recognition software and scanning process was unable to capture some data elements, such as dental encounters. The Vietnam data were incomplete because many patient encounter forms from that country were not scanned due to the use of a slightly differently configured translated form. This meant that these forms were not able to be scanned.

Patient encounter data.

The number of patient encounter forms for each location is shown in Table 18. The patient encounter form was not used to document patients only seeking immunizations, therefore the counts in Table 18 do not include that population.

Table 18
Patient Count for Each Location

Count	*N*	Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row Total
Missing	1,244	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Female	8,421	2,403	15.47	747	4.81	3,325	21.41	1,000	6.44	313	2.02	633	4.08	54.22
Male	5,865	1,944	12.52	882	5.68	1,482	9.54	866	5.58	166	1.07	525	3.38	37.77

Patients may have been seen by one specialty (e.g., optometry) or by multiple specialties (e.g., medical and optometry). Medical and optometry providers then checked a diagnosis box or boxes for each patient, which resulted in one patient possibly having multiple diagnoses. Table 19 shows the number of diagnoses by specialty for all patients seen by USS Peleliu medical providers during Pacific Partnership 2007. The most common diagnoses were noted in the musculoskeletal category, followed closely by those in the pulmonary, ophthalmology, head, eye, ear, nose, and throat (HEENT), and skin categories. Later tables detail the most common diagnoses in the top five categories. While the optometry section has the largest number of patients seen, that section of the form did not contain diagnoses. Instead, it contained treatments such as glasses, eye drops, or other eye medications. The procedure section of the form tried to capture prescriptions, minor procedures, sutures, wound care, and measles immunizations. The count for procedures is high since most patients seen were given a prescription. The count would have been higher if providers had been trained on the form and checked the medication (Rx) box for every patient that received medication.

Table 19
Number of Diagnoses by Specialty for Patients Seen by USS Peleliu During Pacific Partnership 2007

Specialty	*N*	(%)
Optometry	6,810	28.57%
Musculoskeletal	2,979	12.50%
Pulmonary	2,306	9.67%
Ophthalmology	2,281	9.57%
Head, eye, ear, nose, throat	2,238	9.39%
Procedure	1,668	7.00%
Dermatology	1,664	6.98%
Gastrointestinal	970	4.07%
Cardiovascular	821	3.44%
Miscellaneous	770	3.23%
General	463	1.94%
Infectious disease	310	1.30%

Specialty	*N*	(%)
Gynecological	243	1.02%
Neurological	234	0.98%
Trauma	81	0.34%
Total	23,838	100.00%

While musculoskeletal diagnoses were the most frequent overall, they were not the most frequent at all locations. Table 20 shows how the categories rank by location. Musculoskeletal diagnoses were most common in Papua New Guinea, Solomon Islands, and Micronesia. Diagnoses in the HEENT category were most frequent in the Marshall Islands and pulmonary diagnoses were most frequent in the Philippines. Vietnam data were not included in Table 21 because it was incomplete.

Table 20

Diagnosis Categories in Rank Order by Location

Category	Marshall Islands	Papua New Guinea	Philippines	Solomon Islands	Micronesia
Musculoskeletal	2	1	3	1	1
Pulmonary	3	2	1	5	3
Head, eye, ear, nose, throat	1	4	2	3	4
Skin	4	3	4	2	2
Gastrointestinal	5	5	–	4	–
Cardiovascular	–	–	5	–	5

A more detailed review of the optometry data shown in Table 21 illustrates that almost 88% of optometry patients received reading glasses. The Marshall Islands and Philippines made up a large portion of the optometry patient population. (Optometry services were not offered in Micronesia and therefore there were no data for that location.)

Table 21

Optometry Treatments Provided by USS Peleliu During Pacific Partnership 2007

Optometry		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Row total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Distance glasses	377	50	0.73	37	0.54	244	3.58	35	0.51	11	0.16	5.54
Eye drops	321	96	1.41	32	0.47	156	2.29	27	0.40	10	0.15	4.71
Other eye meds	128	26	0.38	10	0.15	83	1.22	7	0.10	2	0.03	1.88

Optometry		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Row total
Reading glasses	5,984	1,971	28.94	715	10.50	2,302	33.80	820	12.04	176	2.58	87.87
Totals	6,810	2,143	31.47	794	11.66	2,785	40.90	889	13.05	199	2.92	100

Musculoskeletal conditions made up 11% of the total patient diagnoses. Lower back pain, joint pain, and arthritis accounted for over 50% of the musculoskeletal diagnoses. Table 22 shows the frequency of other recorded conditions by location. On future forms arthritis, degenerative joint disease, and joint pain will be combined as a single diagnosis choice labeled joint pain.

Table 22

Musculoskeletal Diagnoses by Location During Pacific Partnership 2007

Musculoskeletal		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row Total
	N	***n***	%	***n***	%	***n***	%	***n***	%	***n***	%	***n***	%	%
Arthritis	369	55	1.85	71	2.38	194	6.51	21	0.70	21	0.70	7	0.23	12.39
Contracture	8	–	0.00	5	0.17	3	0.10	–	0.00	–	0.00	–	0.00	0.27
Degenerative joint disease	152	28	0.94	72	2.42	16	0.54	28	0.94	8	0.27	–	0.00	5.10
Fracture	13	2	0.07	6	0.20	3	0.10	2	0.07	–	0.00	–	0.00	0.44
Gout	24	6	0.20	–	0.00	12	0.40	–	0.00	–	0.00	6	0.20	0.81
Joint pain	619	79	2.65	214	7.18	141	4.73	62	2.08	29	0.97	94	3.16	20.78
Lower back pain	998	245	8.22	295	9.90	248	8.32	124	4.16	19	0.64	67	2.25	33.50
Muscle pain	403	61	2.05	77	2.58	197	6.61	38	1.28	18	0.60	12	0.40	13.53
Osteoporosis	7	1	0.03	2	0.07	3	0.10	–	0.00	1	0.03	–	0.00	0.23
Other	308	52	1.75	66	2.22	78	2.62	53	1.78	11	0.37	48	1.61	10.34
Sprain	13	2	0.07	2	0.07	5	0.17	3	0.10	1	0.03	–	0.00	0.44
Strain	12	5	0.17	2	0.07	–	0.00	2	0.07	1	0.03	2	0.07	0.40
Tendonitis	53	16	0.54	8	0.27	20	0.67	6	0.20	1	0.03	2	0.07	1.78
Totals	2,979	552	18.53	820	27.53	920	30.88	339	11.38	110	3.69	238	7.99	100

The ophthalmology patient diagnoses were comprised of patients that were seen by both optometry and medical providers. The most frequent diagnoses were presbyopia, cataract, and blurred vision. Ophthalmology diagnoses by location are displayed in Table 23.

Table 23
Ophthalmology Diagnoses by Location During Pacific Partnership 2007

Ophthalmology		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Blurred vision	271	12	0.53	60	2.63	138	6.05	58	2.54	2	0.09	1	0.04	11.87
Cataract	305	54	2.37	62	2.72	142	6.23	11	0.48	36	1.58	–	0.00	13.41
Conjunctivitis	121	37	1.62	14	0.61	59	2.59	5	0.22	3	0.13	3	0.13	5.19
Eye foreign body	3	–	0.00	–	0.00	2	0.09	1	0.04	–	0.00	–	0.00	0.13
Eye pain	69	5	0.22	5	0.22	55	2.41	3	0.13	–	0.00	1	0.04	2.99
Glaucoma	34	6	0.26	3	0.13	21	0.92	1	0.04	2	0.09	1	0.04	1.45
Presbyopia	1,191	553	24.24	231	10.13	155	6.80	215	9.43	37	1.62	–	0.00	52.37
Pterygium	136	46	2.02	27	1.18	46	2.02	5	0.22	12	0.53	–	0.00	5.98
Visual disturbance	68	1	0.04	2	0.09	64	2.81	–	0.00	1	0.04	–	0.00	2.99
Visual loss	83	11	0.48	16	0.70	41	1.80	5	0.22	9	0.39	1	0.04	3.61
Totals	2,281	725	31.78	420	18.41	723	31.70	304	13.33	102	0.04	7	0.31	100

Acute and chronic diseases of the pulmonary system accounted for approximately 9% of all patient diagnoses. Pulmonary diagnoses data are found in Table 24. Cough was the most frequent diagnosis in the pulmonary category and it was most frequently seen in the Philippines. The Philippines had the highest number of pulmonary diagnoses compared with other locations. Upper respiratory infection (URI), the second most common pulmonary diagnosis, was a choice in both pulmonary and the HEENT categories, which may distort the data. This discrepancy will be corrected on future patient encounter forms.

Table 24
Pulmonary Diagnoses by Location During Pacific Partnership 2007

Pulmonary		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Asthma	299	35	1.52	43	1.86	196	8.50	13	0.56	6	0.26	6	0.26	12.97
Bronchitis	99	16	0.69	41	1.78	28	1.21	7	0.30	3	0.13	4	0.17	4.29
Cough	796	93	4.03	104	4.51	500	21.68	33	1.43	41	1.78	25	1.08	34.52
Dyspnea	53	10	0.43	5	0.22	30	1.30	5	0.22	3	0.13	–	0.00	2.30
Other	106	23	1.00	18	0.78	47	2.04	11	0.48	5	0.22	2	0.09	4.60
Pneumonia	183	29	1.26	40	1.73	99	4.29	12	0.52	2	0.09	1	0.04	7.94
Reactive airway disease	44	11	0.48	14	0.61	17	0.74	2	0.09	–	0.00	–	0.00	1.91

Pulmonary		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Upper respiratory disease	726	131	5.68	93	4.03	401	17.39	20	0.87	8	0.35	73	3.17	31.48
Totals	2,306	348	15.09	358	15.52	1,318	57.16	103	4.47	68	2.95	111	4.81	100

Over 2,000 HEENT diagnoses were determined during Pacific Partnership 2007, and they accounted for approximately 9% of all patient diagnoses. Table 25 shows the more specific HEENT diagnoses given during Pacific Partnership 2007. Medical providers assigned otitis media most frequently and the Marshall Islands had the largest incidence of this condition in the HEENT category; the "other" box was frequently marked. Common written diagnoses include ear wax impaction, headache, swollen lymph nodes, and pharyngitis. Headache will be a diagnosis choice on future forms.

Table 25

HEENT Diagnoses by Location During Pacific Partnership 2007

Head, eye, ear, nose, throat		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Allergies	161	30	1.34	7	0.31	89	3.98	12	0.54	17	0.76	6	0.27	7.19
Foreign bodies	30	13	0.58	1	0.04	13	0.58	2	0.09	1	0.04	–	0.00	1.34
Goiter	158	1	0.04	1	0.04	152	6.79	3	0.13	1	0.04	–	0.00	7.06
Hearing loss	105	29	1.30	25	1.12	42	1.88	8	0.36	1	0.04	–	0.00	4.69
Hyperthyroidism	9	1	0.04	1	0.04	6	0.27	1	0.04	–	0.00	–	0.00	0.40
Hypothyroidism	6	1	0.04	–	0.00	5	0.22	–	0.00	–	0.00	–	0.00	0.27
Other	610	162	7.24	68	3.04	259	11.57	33	1.47	28	1.25	60	2.68	27.26
Otitis externa	107	37	1.65	14	0.63	37	1.65	10	0.45	1	0.04	8	0.36	4.78
Otitis media	596	223	9.96	106	4.74	146	6.52	88	3.93	13	0.58	20	0.89	26.63
Sinusitis	83	19	0.85	8	0.36	41	1.83	6	0.27	9	0.40	–	0.00	3.71
Upper respiratory disease/viral syndrome	333	114	5.09	18	0.80	193	8.62	7	0.31	1	0.04	–	0.00	14.88
Vertigo	40	1	0.04	–	0.00	38	1.70	–	0.00	1	0.04	–	0.00	1.79
Totals	2,238	631	28.19	249	11.13	1,021	45.62	170	7.60	73	0.03	94	4.20	100

Skin-related conditions accounted for approximately 6% of all patient diagnoses and are found in Table 26. "Other" was the most frequent diagnosis. Written skin diagnoses included: cysts, burns, lipoma, and wounds. Medical providers listed tinea as the second most-frequent diagnosis. Papua New Guinea and the Solomon Islands had the highest incidence of this condition.

Table 26

Skin Diagnoses by Location During Pacific Partnership 2007

Skin		Marshall Islands		Papua New Guinea		Philippines		Solomon Islands		Vietnam		Micronesia		Row Total
	N	***n***	%	***n***	%	***n***	%	***n***	%	***n***	%	***n***	%	%
Abscess	74	20	1.20	7	0.42	38	2.28	7	0.42	–	0.00	2	0.12	4.91
Cellulitis	44	12	0.72	6	0.36	15	0.90	3	0.18	1	0.06	7	0.42	2.53
Contact dermatitis	49	14	0.84	4	0.24	25	1.50	6	0.36	–	0.00	–	0.00	3.34
Dermatitis	166	8	0.48	5	0.30	71	4.27	12	0.72	5	0.30	65	3.91	6.89
Eczema	82	10	0.60	5	0.30	59	3.55	3	0.18	–	0.00	5	0.30	5.26
Folliculitis	17	4	0.24	1	0.06	6	0.36	6	0.36	–	0.00	–	0.00	1.16
Heat rash	23	6	0.36	2	0.12	12	0.72	3	0.18	–	0.00	–	0.00	1.57
Impetigo	128	69	4.15	20	1.20	32	1.92	7	0.42	–	0.00	–	0.00	8.74
Insect bite	13	5	0.30	1	0.06	5	0.30	1	0.06	–	0.00	1	0.06	0.82
Lice	5	–	0.00		0.00	5	0.30		0.00	–	0.00	–	0.00	0.34
Other	415	52	3.13	43	2.58	253	15.20	51	3.06	4	0.24	12	0.72	27.51
Pruritus	22	–	0.00	2	0.12	16	0.96	3	0.18	1	0.06	–	0.00	1.50
Psoriasis	14	2	0.12		0.00	9	0.54		0.00	1	0.06	2	0.12	0.82
Pyderma/furunculosis	38	17	1.02	4	0.24	11	0.66	6	0.36	–	0.00	–	0.00	2.59
Scabies	124	48	2.88	17	1.02	4	0.24	39	2.34	1	0.06	15	0.90	7.44
Tinea	439	52	3.13	151	9.07	36	2.16	109	6.55	1	0.06	90	5.41	23.82
Warts	11	1	0.06	1	0.06	9	0.54		0.00	–	0.00	–	0.00	0.75
Totals	1,664	320	19.23	269	16.17	606	36.42	256	15.38	14	0.84	199	11.96	100

Conclusions.

These tables provide a brief look at the more common patient conditions recorded on patient encounter forms during Pacific Partnership 2007 and surgical cases. The Naval Health Research Center hopes to use the patient condition data from HA missions to develop HA supply sets and reveal areas where the HA missions can be improved. Pacific Partnership 2007 was the first time the patient encounter form was successfully used on an HA mission, and providers were untrained on the form as a data collection tool. As provider training develops and the form itself improves, the data collected will help plan future Navy HA missions.

Continuing Promise 2008

In 2008, two amphibious ships, the USS Boxer (LHD-4) and the USS Kearsarge (LHD-3), visited five Latin American and three Caribbean countries as a part of the Navy's ongoing HA program named Continuing Promise. USS Boxer made stops in Peru, El Salvador, and Guatemala and USS Kearsarge made stops in Columbia, Dominican Republic, Guyana, Haiti, Nicaragua, and Trinidad and Tobago. Tables 27 summarizes the patient demographics for each location visited. The Pacific phase was completed by USS Boxer April–June of 2008, and medical providers treated over 20,000 patients, while USS Kearsarge deployed August–November 2008 for the Atlantic phase, and treated over 40,000 patients. Almost 60% of the patients seen were female.

Table 27

Continuing Promise 2008 Patient Demographics by Location

Location	Male		Female		Missing		Row Total	
	n	%	*n*	%	*n*	%	*n*	%
El Salvador	3,861	34.93	7,125	64.47	66	0.60	11,052	18.18
Guatemala	1,755	15.88	2,933	26.54	204	1.85	4,892	8.05
Peru	1,548	14.01	3,254	29.44	83	0.75	4,885	8.04
Colombia	1,863	16.86	3,337	30.19	223	2.02	5,423	8.92
Dominican Republic	4,647	42.05	7,905	71.53	2,417	21.87	14,969	24.63
Guyana	1,846	16.70	2,790	25.24	56	0.51	4,692	7.72
Haiti	14	0.13	37	0.33	1,026	9.28	1,077	1.77
Nicaragua	3,180	28.77	5,834	52.79	446	4.04	9,460	15.56
Trinidad & Tobago	1,541	13.94	2,706	24.48	83	0.75	4,330	7.12
Totals	20,255	33.33	35,921	59.10	4,604	0.08	60,780	100.00

Acute medical care, optometry, and dental services were provided ashore at each location. Patient encounter data were collected using a scannable form with common diagnoses organized by anatomical region. The completed forms were scanned and optical character recognition software extracted the information into a database. The data presented were a result of successfully scanned and extracted forms.

Table 28 displays frequency of diagnosis categories for each phase of Continuing Promise 2008. One difference is that dental treatments were not captured on the USS Boxer patient encounter forms. A large portion of patients sought optometry and ophthalmology services during the mission. Other frequent diagnosis categories include HEENT, musculoskeletal, general symptoms, and gastrointestinal.

Table 28
Continuing Promise 2008 Diagnoses by Specialty

Diagnosis	USS BOXER		USS KEARSARGE	
	n	%	*n*	%
Head, eye, ear, nose, throat	2,527	9.25	2,738	4.36
Optometry	4,790	17.54	8,368	13.34
Dental	0	0.00	1,433	2.28
Pulmonary	2,513	9.20	6,431	10.25
Cardio	231	0.85	1,331	2.12
Gastrointestinal	3,008	11.01	4,953	7.89
Gynecological	1,130	4.14	2,372	3.78
Musculoskeletal	3,178	11.64	7,522	11.99
Skin	2,111	7.73	3,915	6.24
Neurological	771	2.82	3,228	5.15
Trauma	81	0.30	167	0.27
Infectious disease	438	1.60	2,555	4.07
Ophthalmology	3,722	13.63	8,303	13.23
Nephrology	0	0.00	1,571	2.50
General	1,904	6.97	7,186	11.45
Miscellaneous	910	3.33	665	1.06
Totals	27,314	100.00	62,738	100.00

Just over half of the countries visited during Continuing Promise 2008 had musculoskeletal diagnoses as the most frequent diagnoses. Patients in Guatemala and Haiti had gastrointestinal diagnoses more often than other categories, while Columbia and the Dominican Republic had general symptoms as the most frequent diagnosis category. Tables summarizing the most common diagnoses in the top categories follow.

Table 29
Rank Order of Diagnosis Categories by Location

Diagnosis	Guyana	Columbia	Dominican Republic	Haiti	Nicaragua	Trinidad &Tobago	Peru	Guatemala	El Salvador
Cardiovascular	–	–	–	–	–	4	–	–	–
General	5	1	1	4	2	2	5	–	–
Gastrointestinal	2	5	4	1	3	5	2	1	2
Head, eye, ear, nose, throat	–	–	–		–	–	4	4	3
Musculoskeletal	1	2	3	3	1	1	1	3	1

Diagnosis	Guyana	Columbia	Dominican Republic	Haiti	Nicaragua	Trinidad &Tobago	Peru	Guatemala	El Salvador
Neurological	–	–	–		5	–	–	–	–
Pulmonary	4	3	2	2	4	3	3	5	4
Skin	3	4	5	5	–	–	–	2	5

Overall and at each location, muscle pain was the most frequent diagnosis in the musculoskeletal category during Continuing Promise 2008 as shown in Table 30. Lower back pain, joint pain, and arthritis were other common diagnoses in all locations.

Table 30

Musculoskeletal Diagnoses by Location for Continuing Promise 2008

Location	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*N*	%
Arthritis	82	9.90	153	13.40	167	7.40	2	6.10	212	9.80	146	19.30	192	19.50	69	13.00	227	13.70	1,250	12.10
Degenerative joint disease	0	0.00	0	0.00	2	0.10	0	0.00	0	0.00	0	0.00	34	3.40	17	3.20	17	1.00	70	0.70
Fracture	0	0.00	0	0.00	2	0.10	0	0.00	0	0.00	0	0.00	3	0.30	3	0.60	6	0.40	14	0.10
Gout	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00	0	0.00	2	0.20	1	0.20	2	0.10	6	0.10
Joint Pain	137	16.60	153	13.40	373	16.50	1	3.00	292	13.50	105	13.90	189	19.10	104	19.60	352	21.20	1,706	16.50
Lower back pain	239	28.90	253	22.10	464	20.60	3	9.10	543	25.20	148	19.50	202	20.50	60	11.30	348	21.00	2,260	21.80
Muscle pain	290	35.10	460	40.20	1,092	48.40	22	66.70	920	42.60	192	25.30	251	25.40	181	34.20	531	32.00	3,939	38.00
Osteoporosis	0	0.00	0	0.00	13	0.60	0	0.00	0	0.00	0	0.00	48	4.90	5	0.90	26	1.60	92	0.90
Other	74	9.00	124	10.80	133	5.90	5	15.20	186	8.60	161	21.20	55	5.60	82	15.50	138	8.30	958	9.30
Sprain	0	0.00	1	0.10	7	0.30	0	0.00	4	0.20	3	0.40	3	0.30	2	0.40	3	0.20	23	0.20
Strain	4	0.50	1	0.10	1	0.00	0	0.00	2	0.10	3	0.40	0	0.00	0	0.00	0	0.00	11	0.10
Tendonitis	0	0.00	0	0.00	2	0.10	0	0.00	0	0.00	0	0.00	8	0.80	6	1.10	11	0.70	27	0.30
Total	826	100	1,145	100	2,257	100	33	100	2,159	100	758	100	987	100	530	100	1,661	100	10,356	100

As shown in Table 31, dyspepsia was the most common gastrointestinal (GI) category diagnosis overall and in many locations, including Guyana, Haiti, Peru, and El Salvador. Abdominal pain was the most frequent GI diagnosis in Nicaragua and accounted for approximately 20% of the GI diagnoses in Guyana, Colombia, and the Dominican Republic. Gastroesophageal reflux disease (GERD) accounted for 20% or more of GI diagnoses in Guyana, Colombia, Dominican Republic, Haiti, Trinidad & Tobago, and Peru.

Table 31

Gastrointestinal Diagnoses by Location for Continuing Promise 2008

Diagnosis	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	n	%	*n*	%	*N*	%
Abdominal pain	96	19.50	149	20.40	309	19.60	2	4.80	483	33.00	12	3.60	13	1.90	40	4.90	55	3.40	1,159	15.00
Colitis	0	0.00	0	0.00	4	0.30	0	0.00	0	0.00	0	0.00	8	1.20	8	1.00	77	4.80	97	1.30
Constipation	24	4.90	50	6.80	194	12.30	0	0.00	24	1.60	34	10.10	130	19.00	97	11.80	227	14.20	780	10.10
Diarrhea/ gastroenteritis	32	6.50	76	10.40	151	9.60	7	16.70	187	12.80	12	3.60	44	6.40	157	19.20	218	13.70	884	11.40
Dyspepsia	167	33.90	146	20.00	361	22.90	13	31.00	311	21.20	104	30.80	192	28.00	182	22.20	368	23.10	1,844	23.80
Dysphagia	0	0.00	0	0.00	5	0.30	0	0.00	0	0.00	0	0.00	24	3.50	14	1.70	42	2.60	85	1.10
GERD	122	24.80	148	20.20	397	25.20	13	31.00	259	17.70	116	34.30	180	26.20	109	13.30	298	18.70	1,642	21.20
Other	51	10.40	162	22.20	156	9.90	7	16.70	201	13.70	60	17.80	95	13.80	212	25.90	311	19.50	1,255	16.20
Total	492	100.00	731	100.00	1,577	100.00	42	100.00	1,465	100.00	338	100.00	686	100.00	819	100.00	1,596	100.00	7,746	100.00

Upper respiratory infections and cough account for almost 70% of the pulmonary diagnoses from Continuing Promise 2008 as displayed in Table 32. Bronchitis accounted for greater than 12% of pulmonary diagnoses in Colombia, Nicaragua, Peru, and Guatemala and asthma was at least 10% of the pulmonary diagnoses in Guyana, Nicaragua, Trinidad & Tobago, and Guatemala.

Table 32

Pulmonary Diagnoses by Location for Continuing Promise 2008

Location	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*N*	%
Asthma	50	11.20	60	7.30	156	5.50	4	10.00	132	10.40	84	19.10	55	11.10	53	10.60	71	4.70	665	7.90
Bronchitis	39	8.80	126	15.40	233	8.20	3	7.50	216	17.10	37	8.40	76	15.30	65	13.00	96	6.30	891	10.60
Cough	62	13.90	157	19.20	620	21.70	9	22.50	375	29.60	79	18.00	179	36.10	172	34.30	600	39.60	2,253	26.90
Dyspnea	0	0.00	0	0.00	11	0.40	0	0.00	0	0.00	0	0.00	7	1.40	4	0.80	42	2.80	64	0.80
Other	25	5.60	44	5.40	104	3.60	10	25.00	105	8.30	136	31.00	45	9.10	84	16.80	149	9.80	702	8.40
Pneumonia	12	2.70	40	4.90	64	2.20	2	5.00	56	4.40	11	2.50	14	2.80	24	4.80	31	2.00	254	3.00
Reactive airway disease	0	0.00	0	0.00	5	0.20	0	0.00	0	0.00	0	0.00	22	4.40	9	1.80	29	1.90	65	0.80
URI	257	57.80	390	47.70	1,664	58.20	12	30.00	381	30.10	92	21.00	98	19.80	90	18.00	498	32.80	3,482	41.60
Total	445	100.00	817	100.00	2,857	100	40	100.00	1,265	100.00	439	100.00	496	100.00	501	100.0	1,516	100.00	8,376	100.00

Table 33 summarizes the skin diagnoses seen during Continuing Promise 2008 by location. Overall, the most common skin diagnosis was Tinea followed by other and dermatitis. Of all locations visited, the Dominican Republic and El Salvador had the most patients with a skin diagnosis.

Table 33

Skin Diagnoses by Location for Continuing Promise 2008

Location	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*N*	%
Abscess	12	2.60	13	1.70	57	4.00	0	0.00	16	2.20	5	1.90	2	0.60	1	0.20	31	2.50	137	2.40
Cellulitis	24	5.30	33	4.40	29	2.00	0	0.00	25	3.50	6	2.20	7	2.10	15	2.70	45	3.70	184	3.20
Contact dermatitis	0	0.00	0	0.00	7	0.50	0	0.00	0	0.00	0	0.00	9	2.70	15	2.70	59	4.80	90	1.60
Dermatitis	56	12.40	83	11.10	282	19.60	2	8.30	138	19.40	38	14.20	54	16.30	86	15.70	254	20.60	993	17.30
Eczema	66	14.60	31	4.10	110	7.60	1	4.20	40	5.60	27	10.10	33	10.00	83	15.10	113	9.20	504	8.80
Folliculitis	0	0.00	0	0.00	3	0.20	0	0.00	0	0.00	0	0.00	5	1.50	21	3.80	22	1.80	51	0.90
Heat Rash	3	0.70	2	0.30	22	1.50	0	0.00	6	0.80	2	0.70	1	0.30	15	2.70	15	1.20	66	1.10
Impetigo	0	0.00	0	0.00	10	0.70	0	0.00	0	0.00	0	0.00	4	1.20	10	1.80	31	2.50	55	1.00
Insect bite	6	1.30	23	3.10	23	1.60	0	0.00	13	1.80	4	1.50	1	0.30	6	1.10	17	1.40	93	1.60
Lice	4	0.90	12	1.60	6	0.40	0	0.00	24	3.40	2	0.70	0	0.00	1	0.20	2	0.20	51	0.90
Other	115	25.40	195	26.00	266	18.50	9	37.50	188	26.40	97	36.20	102	30.80	137	25.00	236	19.20	1,345	23.40
Pruritus	0	0.00	0	0.00	5	0.30	0	0.00	0	0.00	0	0.00	0	0.00	1	0.20	24	1.90	30	0.50
Psoriasis	0	0.00	0	0.00	10	0.70	0	0.00	0	0.00	0	0.00	7	2.10	11	2.00	21	1.70	49	0.90
Pyoderma/ furunculosis	0	0.00	0	0.00	16	1.10	0	0.00	0	0.00	0	0.00	4	1.20	10	1.80	31	2.50	61	1.10
Scabies	14	3.10	92	12.30	149	10.40	4	16.70	83	11.60	7	2.60	6	1.80	22	4.00	26	2.10	403	7.00
Tinea	145	32.00	246	32.80	430	29.90	8	33.30	163	22.90	75	28.00	89	26.90	102	18.60	294	23.90	1,552	27.00
Warts	8	1.80	19	2.50	13	0.90	0	0.00	17	2.40	5	1.90	7	2.10	13	2.40	10	0.80	92	1.60
Total	453	100	749	100	1,438	100	24	100	713	100	268	100	331	100	549	100	1,231	100	5,756	100

Table 34 displays the diagnoses from the general category and their frequency by location. The most frequent general diagnoses were vitamin deficiency and anemia. It is interesting to note the number of well exams performed at the locations visited by *Kearsarge*. The data collection form used in Peru, Guatemala, and El Salvador did not capture well exams.

Table 34

General Category Diagnoses by Location for Continuing Promise 2008

Location	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*N*	%
Adverse drug reaction	0	0.00	0	0.00	24	0.80	0	0.00	0	0.00	0	0.00	12	2.80	2	0.80	13	1.10	51	0.60
Anemia	35	14.10	202	16.20	925	30.10	2	6.70	349	22.00	51	10.90	72	16.80	35	14.00	283	23.10	1,954	22.80
Dehydration	0	0.00	0	0.00	9	0.30	0	0.00	0	0.00	0	0.00	13	3.00	16	6.40	33	2.70	71	0.80
Diabetes	19	7.70	8	0.60	30	1.00	0	0.00	14	0.90	78	16.60	3	0.70	2	0.80	4	0.30	158	1.80
Malnutrition	6	2.40	17	1.40	58	1.90	0	0.00	23	1.50	3	0.60	59	13.80	67	26.80	156	12.70	389	4.50
Obesity	0	0.00	0	0.00	3	0.10	0	0.00	0	0.00	0	0.00	5	1.20	3	1.20	24	2.00	35	0.40
Other	23	9.30	145	11.60	108	3.50	4	13.30	137	8.70	64	13.60	19	4.40	23	9.20	44	3.60	567	6.60
Poor appetite	13	5.20	98	7.90	657	21.30	0	0.00	127	8.00	2	0.40	0	0.00	0	0.00	0	0.00	897	10.50
Vaccine reaction	0	0.00	0	0.00	2	0.10	0	0.00	0	0.00	0	0.00	1	0.20	1	0.40	1	0.10	5	0.10
Vitamin deficiency	58	23.40	757	60.70	1,201	39.00	24	80.00	924	58.40	47	10.00	244	57.00	101	40.40	668	54.50	4,024	47.00
Well child/adult	94	37.90	21	1.70	61	2.00	0	0.00	9	0.60	225	47.90	0	0.00	0	0.00	0	0.00	410	4.80
Total	248	100	1,248	100	3,078	100	30	100	1,583	100	470	100	428	100	250	100	1,226	100	8,561	100

HEENT diagnoses are shown in Table 35. Other, allergies, and otitis media were the most frequent diagnoses overall. Locations with large HEENT diagnoses include El Salavador, Dominican Republic, and Nicaragua. Top diagnoses for these three countries were other and otitis media. Allergies were most frequent in Trinidad & Tobago, Guyana, Colombia, Nicaragua, and Dominican Republic. Pharyngitis accounted for approximately 20% of HEENT diagnoses in the Dominican Republic, but was not diagnosed as frequently at the other locations.

Table 35

HEENT Diagnoses by Location for Continuing Promise 2008

Diagnosis	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*N*	%
Allergies	50	26.00	94	23.20	209	19.70	3	30.00	133	19.80	63	26.80	51	11.30	45	8.90	126	8.00	774	15.20
Foreign bodies	0	0.00	0	0.00	8	0.80	0	0.00	0	0.00	0	0.00	1	0.20	4	0.80	10	0.60	23	0.50
Goiter	2	1.00	1	0.20	3	0.30	0	0.00	3	0.40	2	0.90	0	0.00	0	0.00	0	0.00	11	0.20
Hearing loss	0	0.00	0	0.00	2	0.20	0	0.00	0	0.00	0	0.00	7	1.50	1	0.20	9	0.60	19	0.40
Hyperthyroidism	1	0.50	11	2.70	6	0.60	0	0.00	3	0.40	7	3.00	0	0.00	0	0.00	0	0.00	28	0.50
Hypothyroidism	0	0.00	0	0.00	3	0.30	0	0.00	6	0.90	3	1.30	0	0.00	0	0.00	0	0.00	12	0.20
Other	46	24.00	86	21.20	221	20.80	2	20.00	153	22.80	66	28.10	241	53.20	346	68.40	959	61.20	2,120	41.60

Diagnosis	Guyana		Colombia		Dominican Republic		Haiti		Nicaragua		Trinidad & Tobago		Peru		Guatemala		El Salvador		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*N*	%
Otitis externa	20	10.40	40	9.90	65	6.10	2	20.00	76	11.30	23	9.80	18	4.00	18	3.60	77	4.90	339	6.60
Otitis media	39	20.30	95	23.40	117	11.00	3	30.00	169	25.20	18	7.70	35	7.70	48	9.50	98	6.30	622	12.20
Pharyngitis	17	8.90	51	12.60	213	20.10	0	0.00	75	11.20	38	16.20	0	0.00	0	0.00	0	0.00	394	7.70
Sinusitis	17	8.90	28	6.90	156	14.70	0	0.00	53	7.90	15	6.40	29	6.40	16	3.20	90	5.70	404	7.90
URI/viral syndrome	0	0.00	0	0.00	12	1.10	0	0.00	0	0.00	0	0.00	19	4.20	10	2.00	116	7.40	157	3.10
Vertigo	0	0.00	0	0.00	45	4.20	0	0.00	0	0.00	0	0.00	52	11.50	18	3.60	83	5.30	198	3.90
Total	192	100	406	100	1,060	100	10	100	671	100	235	100	453	100	506	100	1,568	100	5,101	100

Pacific Partnership 2009

In the summer of 2009, the USNS Richard E Byrd (T-AKE-4) visited five Pacific-region countries as a part of the Navy's ongoing HA program called Pacific Partnership. The ship made stops in Tonga, Samoa, Solomon Islands, Kiribati and Republic of Marshall Islands. Acute medical care, optometry, and dental services were provided ashore at each location. Patient encounter data were collected using a scannable form with common diagnoses organized by anatomical region. The completed forms were scanned and optical character recognition software extracted the information into a database. The data presented are a result of successfully scanned and extracted forms. Table 36 summarizes the patient demographics for the mission. Over 20,000 patients were seen by Pacific Partnership 2009 health care providers. Patients could be seen by medical, dental, and optometry if necessary. Optometry saw 8,221 patients and dental saw 7,114.

Table 36

Pacific Partnership 2009 Patient Demographics by Location

Location	No. of Patients		Male		Female		Missing		Row Total
	N	%	*N*	%	*N*	%	*N*	%	
Kiribati	4,038	19.88	1,668	8.21	2,341	11.52	29	0.14	19.88
RMI	3,593	17.69	1,549	7.63	1,999	9.84	45	0.22	17.69
Samoa	3,460	17.03	1,452	7.15	1,969	9.69	39	0.19	17.03
Solomon Islands	2,871	14.13	1,217	5.99	1,643	8.09	11	0.05	14.13
Tonga	3,940	19.40	1,697	8.35	2,230	10.98	13	0.06	19.40
Unknown	2,412	11.87	1,004	4.94	1,186	5.84	222	1.09	11.87
Totals	20,314	100.00	8,587	42.27	11,368	55.96	359	1.77	100.00

Note: RMI = Republic of Marshall Islands.

Table 37 shows the number of diagnoses by specialty across all locations. Diagnoses in the HEENT category were the most common followed by musculoskeletal and skin ailments. The top five categories, HEENT, musculoskeletal, skin, pulmonary, and gastrointestinal, held the same rank order at all locations visited.

Table 37
Pacific Partnership 2009 Diagnoses by Specialty

Specialty	***N***	%
Head, eye, ear, nose, throat	10,129	50.86
Musculoskeletal	3,340	16.77
Dermatology	2,606	13.09
Pulmonary	1,803	9.05
Gastrointestinal	826	4.15
Cardio	478	2.40
Neurological	251	1.26
Gynecological	238	1.20
Infectious disease	187	0.94

The following tables look at the top five categories in more detail. Table 38 reveals the most common diagnoses in the HEENT category. The most common diagnosis is presbyopia followed by HEENT other and cataract. Frequently seen non-eye disorders include: otitis media, upper respiratory infection viral, otitis externa, and allergies.

Table 38
HEENT Diagnosis by Location for Pacific Partnership 2009

Diagnosis		**Kiribati**		**RMI**		**Samoa**		**Solomon Islands**		**Tonga**		**Unknown**		**Row Total**
	N	***n***	%	***n***	%	***n***	%	***n***	%	***n***	%	***n***	%	%
Allergies	228	83	0.82	18	0.18	43	0.42	16	0.16	33	0.33	35	0.35	2.25
Blurred vision	633	171	1.69	91	0.90	94	0.93	75	0.74	118	1.16	84	0.83	6.25
Cataract	817	164	1.62	111	1.10	230	2.27	103	1.02	142	1.40	67	0.66	8.07
Conjunctivitis	91	34	0.34	15	0.15	18	0.18	7	0.07	8	0.08	9	0.09	0.90
External foreign body	9	3	0.03	0	0.00	2	0.02	0	0.00	2	0.02	2	0.02	0.09
Eye pain	216	28	0.28	10	0.10	77	0.76	22	0.22	53	0.52	26	0.26	2.13
Foreign bodies	19	2	0.02	4	0.04	9	0.09	2	0.02	2	0.02	0	0.00	0.19

Diagnosis		Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Glaucoma	4	0	0.00	0	0.00	3	0.03	0	0.00	1	0.01	0	0.00	0.04
Goiter	17	7	0.07	3	0.03	2	0.02	3	0.03	1	0.01	1	0.01	0.17
Hearing loss	67	17	0.17	11	0.11	19	0.19	11	0.11	7	0.07	2	0.02	0.66
Other	2,542	438	4.32	728	7.19	261	2.58	477	4.71	373	3.68	265	2.62	25.10
Hyper-thyroidism	11	2	0.02	1	0.01	3	0.03	3	0.03	1	0.01	1	0.01	0.11
Hypo-thyroidism	2	1	0.01	0	0.00	1	0.01	0	0.00	0	0.00	0	0.00	0.02
Otitis external	283	93	0.92	59	0.58	63	0.62	26	0.26	28	0.28	14	0.14	2.79
Otitis media	486	124	1.22	99	0.98	53	0.52	86	0.85	60	0.59	64	0.63	4.80
Presbyopia	3,932	669	6.60	652	6.44	982	9.69	554	5.47	728	7.19	347	3.43	38.82
Pterygium	364	43	0.42	24	0.24	149	1.47	44	0.43	42	0.41	62	0.61	3.59
Sinusitis	70	23	0.23	6	0.06	11	0.11	11	0.11	7	0.07	12	0.12	0.69
URI/viral	292	82	0.81	34	0.34	45	0.44	15	0.15	92	0.91	24	0.24	2.88
Vertigo	14	4	0.04	1	0.01	3	0.03	1	0.01	4	0.04	1	0.01	0.14
Visual disturbance	14	3	0.03	2	0.02	3	0.03	4	0.04	0	0.00	2	0.02	0.14
Visual loss	18	1	0.01	4	0.04	6	0.06	7	0.07	0	0.00	0	0.00	0.18
Totals	10,129	1,992	19.67	1,873	18.49	2,077	20.51	1,467	14.48	1,702	16.80	1,018	10.05	100.00

Note: RMI = Republic of Marshall Islands.

The musculoskeletal category was the second most common diagnosis category. Lower back pain was the most common diagnosis in this category as shown in Table 39. Joint pain, other musculoskeletal disorders, and muscle pain were also common.

Table 39

Musculoskeletal Diagnosis by Location for Pacific Partnership 2009

Diagnosis		Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Arthritis	223	40	1.20	19	0.57	53	1.59	57	1.71	25	0.75	29	0.87	6.68
Contracture	8	1	0.03	2	0.06	0	0.00	5	0.15	0	0.00	0	0.00	0.24
Degen. joint disease	114	14	0.42	27	0.81	32	0.96	14	0.42	11	0.33	16	0.48	3.41
Fracture	20	7	0.21	0	0.00	4	0.12	5	0.15	2	0.06	2	0.06	0.60
Gout	24	4	0.12	3	0.09	7	0.21	4	0.12	4	0.12	2	0.06	0.72
Lower back pain	1,019	235	7.04	162	4.85	102	3.05	231	6.92	140	4.19	149	4.46	30.51
Musculoskeletal joint pain	827	106	3.17	48	1.44	255	7.63	147	4.40	167	5.00	104	3.11	24.76

Diagnosis		Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Musculoskeletal other	543	143	4.28	48	1.44	63	1.89	96	2.87	153	4.58	40	1.20	16.26
Muscle pain	350	41	1.23	41	1.23	94	2.81	72	2.16	58	1.74	44	1.32	10.48
Osteoporosis	7	0	0.00	2	0.06	0	0.00	0	0.00	4	0.12	1	0.03	0.21
Sprain	46	5	0.15	8	0.24	19	0.57	2	0.06	9	0.27	3	0.09	1.38
Strain	93	16	0.48	10	0.30	35	1.05	12	0.36	16	0.48	4	0.12	2.78
Tendonitis	66	21	0.63	8	0.24	8	0.24	14	0.42	14	0.42	1	0.03	1.98
Totals	3,340	633	18.95	378	11.32	672	20.12	659	19.73	603	18.05	395	11.83	100.00

Note: RMI = Republic of Marshall Islands; MUSK/SKEL = musculoskeletal.

Skin diagnosis by location is shown in Table 40. Overall, Tinea was the most common skin disorder. Other common skin disorders include impetigo, and insect bites.

Table 40

Skin Diagnosis by Location for Pacific Partnership 2009

Diagnosis	Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row Total	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Abscess/carbuncle	45	1.73	19	0.73	46	1.77	14	0.54	13	0.50	13	0.50	150	5.76
Cellulitis	12	0.46	14	0.54	42	1.61	13	0.50	10	0.38	12	0.46	103	3.95
Contact dermatitis	0	0.00	1	0.04	15	0.58	2	0.08	6	0.23	5	0.19	29	1.11
Dermatitis, unspec.	51	1.96	27	1.04	56	2.15	19	0.73	32	1.23	13	0.50	198	7.60
Eczema	10	0.38	19	0.73	36	1.38	5	0.19	40	1.53	4	0.15	114	4.37
Folliculitis	12	0.46	1	0.04	28	1.07	4	0.15	28	1.07	2	0.08	75	2.88
Heat rash	1	0.04	3	0.12	6	0.23	0	0.00	0	0.00	0	0.00	10	0.38
Impetigo	31	1.19	53	2.03	40	1.53	7	0.27	25	0.96	9	0.35	165	6.33
Insect bite(s)	23	0.88	35	1.34	65	2.49	5	0.19	74	2.84	4	0.15	206	7.90
Lice	9	0.35	0	0.00	1	0.04	1	0.04	32	1.23	9	0.35	52	2.00
Pruritus	5	0.19	4	0.15	16	0.61	3	0.12	9	0.35	1	0.04	38	1.46
Psoriasis	0	0.00	2	0.08	0	0.00	0	0.00	0	0.00	0	0.00	2	0.08
Pyoderma/furunculosis	1	0.04	0	0.00	2	0.08	0	0.00	1	0.04	1	0.04	5	0.19
Scabies/pediculolsis	57	2.19	33	1.27	61	2.34	11	0.42	72	2.76	19	0.73	253	9.71
Other	89	3.42	47	1.80	67	2.57	59	2.26	142	5.45	42	1.61	446	17.11
Tinea	116	4.45	50	1.92	50	1.92	124	4.76	182	6.98	223	8.56	745	28.59

Diagnosis	Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row Total	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Warts	5	0.19	0	0.00	1	0.04	1	0.04	6	0.23	2	0.08	15	0.58
Totals	467	17.92	308	11.82	532	20.41	268	10.28	672	25.79	359	13.78	2,606	100

Note: RMI = Republic of Marshall Islands.

Table 41 captures the pulmonary diagnoses for Pacific Partnership 2009. Overall, upper respiratory infection (38.66%), asthma (18.41%), and cough (14.92%) were the most frequent diagnoses. Asthma was the most frequent diagnosis for each location except Tonga and the unknown location, where upper respiratory infection was most common.

Table 41

Pulmonary Diagnoses by Location for Pacific Partnership 2009

Diagnosis		Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Asthma	332	101	30.51	52	35.86	46	25.56	77	33.05	52	9.83	4	26.67	18.41
Bronchitis	178	59	17.82	21	14.48	12	6.67	46	19.74	36	6.81	4	26.67	9.87
Cough	269	0	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14.92
Reactive airway disease	43	12	3.625	1	0.69	5	2.78	19	8.15	6	1.13	0	0.00	2.38
Pneumonia	145	29	8.761	27	18.62	38	21.11	18	7.73	32	6.05	1	6.67	8.04
Upper respiratory infection	697	122	36.86	42	28.97	72	40.00	56	24.03	400	75.61	5	33.33	38.66
Dyspnea	38	8	2.417	2	1.38	7	3.89	17	7.30	3	0.57	1	6.67	2.11
Other	101	0	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5.60
Totals	1,803	331	18.36	145	8.04	180	9.98	233	12.92	529	29.34	15	0.83	100

Note: RMI = Republic of Marshall Islands; URI = upper respiratory infection.

GI ranked fifth among the diagnosis categories during Pacific Partnership 2009. Overall, the most common GI disorders were abdominal pain, other, dyspepsia and gastroesophageal reflux disease as shown in Table 42. Dyspepsia was the most common diagnosis in all locations except the Solomon Islands where abdominal pain was the most frequent diagnosis.

Table 42

Gastrointestinal Diagnoses by Location for Pacific Partnership 2009

Diagnosis		Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
GI abdominal pain	197	54	21.51	20	20.83	18	23.38	93	36.47	10	13.89	2	40.00	26.06

Diagnosis		Kiribati		RMI		Samoa		Solomon Islands		Tonga		Unknown		Row Total
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	%
Dyspepsia	175	59	23.51	20	20.83	20	25.97	50	19.61	24	33.33	2	40.00	23.15
GI other	179	58	23.11	20	20.83	15	19.48	66	25.88	20	27.78	0	0.00	23.68
GERD	127	42	16.73	27	28.13	14	18.18	30	11.76	13	18.06	1	20.00	16.80
Constipation	73	35	13.94	9	9.38	10	12.99	16	6.27	3	4.17	0	0.00	9.66
Diarrhea/gastroenteritis	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Dysphagia	5	3	1.20	0	0.00	0	0.00	0	0.00	2	2.78	0	0.00	0.66
Totals	756	251	33.20	96	12.70	77	10.19	255	33.73	72	9.52	5	0.66	100.00

Note: RMI = Republic of Marshall Islands; GI = gastrointestinal; GERD = gastroesophageal reflux disease.

The list of dental treatments provided is shown in Table 43. The most common dental treatments were exam and extractions.

Table 43
Dental Treatments for Pacific Partnership 2009

Treatment	*N*	% Mission Dental
Cleaning	273	3.84
Dental other	921	12.95
Exam	2,707	38.05
Extraction(s)	1,950	27.41
Fluoride	1,208	16.98
Sealants	55	0.77
Varnish	0	0.00
Total	7,114	100.00

Pacific Partnership 2010

Pacific Partnership 2010 took place between June and September 2010 with the USNS Mercy (T-AH 19) visiting Vietnam, Cambodia, Indonesia, and Timor-Leste. Other U.S. Navy ships with medical personnel from USNS Mercy visited Papua New Guinea and Palau. Acute medical care (MEDCAP), optometry, and dental services were provided ashore at each location. Patient encounter data were collected using Global Relief Technologies Rapid Data Management System (RDMS). The patient encounters were documented on a personal digital assistant (PDA) with an interface similar to the patient encounter forms used during previous missions. The data were then uploaded to the RDMS Collaborate website. The data presented were downloaded from the RDMS Collaborate website and analyzed. Only patient encounter data from the USNS Mercy portion of the mission are available. As shown in Table 44, over 81,000 patients were seen and over half of the patients were female. Dental providers performed 6,783 treatments and optometry performed 31,416 treatments.

Table 44
Patient Demographics for Pacific Partnership 2010

Category	Cambodia		Indonesia		Timor-Leste		Vietnam		Total	
	N	%	N	%	N	%	N	%	N	%
Male	6,906	36.2	10,461	36.7	9,100	47.3	4,724	31.4	31,191	38.1
Female	12,158	63.8	18,026	63.3	10,130	52.7	10,334	68.6	50,648	61.9
Totals	19,064	100	28,487	100	19,230	100	15,058	100	81,839	100

Table 45 summarizes the diagnoses by specialty for all locations visited by USNS Mercy. The most common diagnosis category was musculoskeletal followed by gastrointestinal and general. The rank order of the diagnoses by specialty for each country is shown in Table 46. Musculoskeletal diagnoses were the most common in Vietnam, Indonesia, and Timor-Leste. In Cambodia, the most common diagnoses were gastrointestinal.

Table 45
Pacific Partnership 2010 Diagnoses by Specialty

	Total	
Specialty	***N***	**%**
General	7,334	14.1
Head, eye, ear, nose, throat	5,907	11.3
Pulmonary	6,424	12.3
Cardiovascular	2,120	4.1
Gastrointestinal	8,577	16.4
Gynecological	1,237	2.4
Neurological	813	1.6
Musculoskeletal	12,495	23.9
Dermatology	4,189	8.0
Trauma	79	0.2
Miscellaneous	1,608	3.1

Specialty	Total *N*	Total %
Infectious disease	1,403	2.7
Total	52,983	100

Table 46
Rank of Diagnoses by Specialty for Each Location

Item	Cambodia	Indonesia	Timor-Leste	Vietnam
General	3		4	2
Head, eye, ear, nose, throat	4	5	5	4
Cardiovascular				5
Pulmonary	5	3	2	
Gastrointestinal	1	2	3	3
Musculoskeletal	2	1	1	1
Dermatology		4		

The following tables look at the top five categories in more detail. Table 47 shows the common diagnoses in the musculoskeletal category by country. Lower back pain, joint pain, and arthritis were the most frequent diagnoses.

Table 47
Musculoskeletal Diagnoses by Location for Pacific Partnership 2010

Musculoskeletal	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Arthritis	421	656	474	831	2,382
Contracture	7	20	22	11	60
Degenerative joint disease	66	104	74	183	427
Fracture	29	32	20	14	95
Gout	8	111	2	9	130
Joint pain	750	702	909	477	2,838
Lower back pain	562	1,002	1,444	725	3,733
Muscle Pain	465	639	835	248	2,187
Osteoporosis	3	3	3	13	22
Other	131	165	78	92	466
Sprain	4	10	11	9	34
Strain	8	19	12	5	44
Tendonitis	10	44	10	13	77
Total	2,464	3,507	3,894	2,630	12,495

Dyspepsia, abdominal pain, and gastroesophageal reflux disease (GERD) were the most common gastrointestinal diagnoses as shown in Table 48. Common “Other” disorders included hemorrhoids, worms, and hernias.

Table 48
Gastrointestinal Diagnoses by Location for Pacific Partnership 2010

Gastrointestinal	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Abdominal pain	955	463	621	323	2,362
Constipation	287	217	124	130	758
Diarrhea/gastroenteritis	179	149	131	52	511
Dyspepsia	506	811	728	421	2,466
Dysphagia	41	19	15	27	102
GERD	469	526	225	226	1,446
Other	397	310	116	109	932
Total	2,834	2,495	1,960	1,288	8,577

Table 49 summarizes the diagnoses from the general category. Headache was the most common diagnosis followed by “other” and vitamin deficiency. “Other” diagnoses included urinary tract infection, well visits, and poor appetite.

Table 49
General Diagnoses by Location for Pacific Partnership 2010

General	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Adverse drug reaction	1	3	0	0	4
Anemia	241	131	321	221	914
Dehydration	106	43	30	100	279
Headache	979	720	920	769	3,388
Malnutrition	147	112	107	195	561
Obesity	9	5	6	5	25
Other	488	269	193	275	1,225
Vaccine reaction	1	0	0	0	1
Vitamin deficiency	268	126	264	279	937
Total	2,240	1,409	1,841	1,844	7,334

Cough was the most frequent pulmonary diagnosis during Pacific Partnership 2010 as displayed in Table 50. Asthma, upper respiratory infections, and bronchitis were also commonly diagnosed during the mission.

Table 50
Pulmonary Diagnoses by Location for Pacific Partnership 2010

Pulmonary	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Asthma	143	377	257	115	892
Bronchitis	113	256	127	99	595
Cough	406	996	1,538	185	3,125
Dyspnea	73	142	56	55	326
Other	55	136	35	22	248
Pneumonia	70	183	88	26	367

Pulmonary	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Reactive airways disease	22	40	25	18	105
Upper respiratory infection	119	289	318	40	766
Total	1,001	2,419	2,444	560	6,424

Table 51 shows dermatitis was the most commonly diagnosed skin disorder. Tinea, “other”, and scabies were also commonly diagnosed. The “other” diagnosis included lipoma, keloid, hemangiomas, dry skin, and acne.

Table 51
Skin Diagnoses by Location During Pacific Partnership 2010

Skin	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Abscess/carbuncle	74	112	46	8	240
Cellulitis	36	96	69	12	213
Contact Dermatitis	11	62	22	28	123
Dermatitis	132	266	290	109	797
Eczema	61	132	93	57	343
Folliculitis	13	39	14	8	74
Heat rash	12	18	16	11	57
Impetigo	29	70	70	14	183
Insect bite(s)	5	58	14	0	77
Lice	6	5	9	0	20
Other	161	248	143	62	614
Pruritus	45	98	141	23	307
Psoriasis	3	30	10	8	51
Pyoderma/furunculosis	3	17	4	0	24
Scabies/pediculosis	58	245	90	36	429
Tinea	47	360	187	26	620
Warts	0	10	5	2	17
Total	696	1,866	1,223	404	4,189

Table 52 summarizes the cardiovascular diagnoses from Pacific Partnership 2010. Hypertension was the most frequently diagnosed disorder followed by chest pain and murmur.

Table 52
Cardiovascular Diagnoses From Pacific Partnership 2010

Cardiovascular	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Angina	15	22	18	43	98
Arrhythmia	20	20	4	31	75
Chest pain	54	93	195	52	394
Congestive heart failure	7	27	6	26	66
Hypertension	216	474	98	237	1,025
Hypotension	4	6	7	10	27

Cardiovascular	Cambodia	Indonesia	Timor-Leste	Vietnam	Total
Murmur	29	16	11	88	144
Other	33	51	14	31	129
Palpitations	39	36	2	17	94
Rheumatic fever	1	1	1	0	3
Rheumatic heart disease	2	0	0	2	4
Syncope	1	6	3	8	18
Valvular disease	7	1	1	34	43
Total	428	753	360	579	2,120

Pacific Partnership 2011

During Pacific Partnership 2011, USS Cleveland (LPD-7) visited Tonga, Vanuatu, Papua New Guinea, Timor-Leste, and the Federated States of Micronesia. The mission took place between March and July 2011. Acute medical care (MEDCAP), optometry, and dental services were provided ashore at each location. Patient encounter data were collected using Global Relief Technologies Rapid Data Management System (RDMS). The patient encounters were documented on a personal digital assistant (PDA) with an interface similar to the patient encounter forms used during previous missions. The data were then uploaded to the RDMS Collaborate website. The data presented were downloaded from the RDMS Collaborate website and analyzed. Table 53 displays the patient demographics for the mission. There were slightly more females than males seen and the providers saw the largest number of patients in Papua New Guinea.

Table 53
Patient Demographics for Pacific Partnership 2011

Category	Micronesia		Papua New Guinea		Timor-Leste		Tonga		Vanuatu		Total
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	
Female	2,458	57.1	5,968	55.8	2,057	48.2	2,669	58.3	3,633	54.4	16,785
Male	1,850	42.9	4,724	44.2	2,207	51.8	1,906	41.6	3,049	45.6	13,736
Total	4,308	100	10,692	100	4,264	100	4,575	100	6,682	100	30,523

As seen in Table 54 musculoskeletal disorders were the most frequent diagnoses followed by head, ear, eye, nose, and throat problems (HEENT), pulmonary ailments, and skin disorders. The rank order of the diagnoses by specialty for each country is shown in Table 55. Musculoskeletal diagnoses were the most frequent at all locations visited.

Table 54
Pacific Partnership 2011 Diagnosis by Specialty

Specialty	*N*	%
General	677	3.1
Head, eye, ear, nose, throat	3292	15.1
Pulmonary	3077	14.1
Cardiovascular	887	4.1
Gastrointestinal	1972	9.0
Gynecological	474	2.2
Musculoskeletal	6889	31.6
Dermatology	2810	12.9
Neurological	503	2.3
Trauma	55	0.3
Miscellaneous	439	2.0
Infectious Disease	732	3.4
Total	21,807	100

Table 55
Specialty Diagnoses Rank Order by Location

Specialty	Micronesia	Papua New Guinea	Timor-Leste	Tonga	Vanuatu
Cardiovascular				5	
Gastrointestinal	5	4	4		5
Head, eye, ear, nose, throat	2	3	3	3	2
Musculoskeletal	1	1	1	1	1
Pulmonary	4	2	2	4	4
Dermatology	3	5	5	2	3

Tables detailing the top five specialty diagnoses follow. Table 56 shows lower back pain as the most frequent musculoskeletal diagnosis at each location. Joint pain, muscle pain, and arthritis were also frequently diagnosed.

Table 56
Musculoskeletal Diagnoses by Location During Pacific Partnership 2011

Item	Micronesia	Papua New Guinea	Timor-Leste	Tonga	Vanuatu	Total
Arthritis	72	91	51	100	122	436
Contracture	2	8	0	7	2	19
Degenerative joint disease	29	58	11	34	31	163
Fracture	2	21	2	6	4	35
Gout	5	6	1	25	3	40
Joint Pain	263	886	228	225	421	2,023
Lower back pain	301	1,353	465	257	601	2,977
Muscle pain	89	142	167	59	135	592
Osteoporosis	1	0	1	1	1	4
Other	25	128	27	85	98	363
Sprain	8	23	4	23	16	74
Strain	16	19	8	27	32	102
Tendonitis	10	18	3	11	19	61
Total	823	2,753	968	860	1,485	6,889

Pulmonary diagnoses are shown in Table 57. Cough, asthma, and upper respiratory infection were frequently diagnosed during the mission. Interestingly, one third of all pulmonary diagnoses were seen in Papua New Guinea alone.

Table 57
Pulmonary Diagnoses by Location During Pacific Partnership 2011

Item	Micronesia	Papua New Guinea	Timor-Leste	Tonga	Vanuatu	Total
Asthma	54	187	59	63	136	499
Bronchitis	24	133	27	42	59	285
Cough	117	497	375	172	239	1,400
Dyspnea	3	13	9	12	6	43

Other	19	55	36	39	26	175
Pneumonia	27	82	25	48	12	194
Reactive airways disease	9	20	8	23	8	68
Upper respiratory infection	27	130	83	118	55	413
Total	280	1,117	622	517	541	3,077

Upper respiratory infection (URI/viral syndrome) was the most frequent HEENT diagnosis followed by otitis media and "other". "Other" diagnoses include ear pain, impacted cerumen, and rhinitis.

Table 58
HEENT Diagnoses by Location During Pacific Partnership 2011

Item	Micronesia	Papua New Guinea	Timor-Leste	Tonga	Vanuatu	Total
Allergies	41	76	37	17	42	213
Blurred vision	0	4	0	13	9	26
Cataract	2	1	0	25	5	33
Conjunctivitis	3	13	3	3	24	46
External	0	1	0	0	2	3
Eye foreign body	0	1	0	0	2	3
Eye Pain	1	0	3	3	7	14
Foreign Bodies	0	7	1	3	3	14
Glaucoma	0	0	0	0	1	1
Goiter	1	5	4	1	7	18
Hearing loss	24	65	24	13	47	173
Hyperthyroidism	1	1	0	1	0	3
Hypothyroidism	0	0	0	2	1	3
Other	76	139	55	111	158	539
Otitis externa	53	92	22	59	84	310
Otitis media	96	225	81	119	210	731
Presbyopia	5	0	0	34	1	40
Pterygium	7	3	0	11	3	24
Sinusitis	29	58	21	27	30	165
URI/viral syndrome	148	215	224	132	189	908
Vertigo	2	1	3	2	4	12
Visual disturbance	2	4	0	2	1	9
Visual loss	0	2	0	0	2	4
Total	491	913	478	578	832	3,292

Tinea was the most frequently diagnosed skin disorder as shown in Table 59. Lipoma, ulcers, pityriasis, and yaws are included in the "other" diagnosis, the second most frequent skin diagnosis.

Table 59
Skin Diagnoses by Location During Pacific Partnership 2011

Item	Micronesia	Papua New Guinea	Timor-Leste	Tonga	Vanuatu	Total
Abscess/carbuncle	21	37	8	52	57	175
Cellulitis	56	53	21	71	82	283
Contact dermatitis	13	3	8	24	7	55
Dermatitis	71	18	55	81	25	250
Eczema	43	21	41	55	18	178
Folliculitis	5	6	6	13	5	35
Heat rash	8	4	5	23	2	42
Impetigo	43	6	9	57	31	146
Insect bite(s)	22	11	3	33	15	84
Lice	7	3	0	13	12	35
Other	67	109	39	174	156	545
Pruritus	14	5	21	15	7	62
Psoriasis	7	3	1	0	1	12
Pyoderma/furunculosis	2	1	1	2	1	7
Scabies/pediculosis	64	14	2	16	27	123
Tinea	219	100	70	197	151	737
Warts	4	4	3	19	11	41
Total	666	398	293	845	608	2,810

Abdominal pain, dyspepsia, and gastroesophageal reflux disease (GERD) were the most frequent gastrointestinal diagnoses as shown in Table 60. “Other” diagnoses included emesis, worm infestation, hemorrhoids, and hernia.

Table 60
Gastrointestinal Diagnoses by Location During Pacific Partnership 2011

Item	*Micronesia*	Papua New Guinea	Timor-Leste	Tonga	Vanuatu	Total
Abdominal pain	45	163	103	22	175	508
Constipation	20	28	29	15	37	129
Diarrhea/gastroenteritis	15	35	38	8	26	122
Dyspepsia	78	160	126	30	109	503
Dysphagia	2	4	1	1	3	11
GERD	88	163	94	38	103	486
Other	30	88	25	27	43	213
Total	278	641	416	141	496	1,972

Vanuatu and Tonga had the highest number of cardiovascular disorders with hypertension being the most frequent diagnosis followed by chest pain as shown in Table 61. Costochrondritis, varicose veins, and edema were included under “other” diagnosis.

Table 61

Cardiovascular Diagnoses by Location During Pacific Partnership 2011

Item	Micronesia	Papua New Guinea	Timor-Leste	Tonga	Vanuatu	Total
Angina	6	3	1	10	8	28
Arrhythmia	3	2	2	2	7	16
Chest pain	18	31	73	23	47	192
Congestive heart failure	7	4	0	2	0	13
Hypertension	101	17	28	170	166	482
Hypotension	1	0	3	0	0	4
Murmur	13	7	4	3	7	34
Other	10	17	6	16	18	67
Palpitations	0	4	3	10	4	21
Rheumatic heart disease	6	3	0	4	1	14
Syncope	1	1	0	1	1	4
Valvular disease	1	1	0	4	6	12
Total	167	90	120	245	265	887

Appendix G
Expanded ICD-9 List With Category and Subcategory

ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
001.9	Cholera Unspecified	Disease	Gastrointestinal Disorders	Cholera
002.0	Typhoid Fever	Disease	Infectious Disease	Typhoid Fever
004.9	Shigellosis Unspecified	Disease	Gastrointestinal Disorders	Dysentery
005	Food Poisoning Bacterial	Disease	Gastrointestinal Disorders	Diarrhea/Enterocolitis
006	Amebiasis	Disease	Infectious Disease	Other Infections
007.9	Unspecified Protozal Intestinal Disease	Disease	Gastrointestinal Disorders	Diarrhea/Enterocolitis
008.45	Intestinal Infection Due To Clostridium Difficile	Disease	Gastrointestinal Disorders	Diarrhea/Enterocolitis
008.8	Intestinal Infection Due To Other Organism Not Classified	Disease	Gastrointestinal Disorders	Diarrhea/Enterocolitis
010	Primary Tuberculosis Infection	Disease	Respiratory Disorders	Tuberculosis
037	Tetanus	Disease	Infectious Disease	Other Infections
038.9	Unspecified Septicemia	Disease	Infectious Disease	Other Infections
042	HIV	Disease	Infectious Disease	Other Infections
047.9	Viral Meningitis	Disease	Infectious Disease	Other Viral Disorders
052	Varicella (Chickenpox)	Disease	Infectious Disease	Varicella/Herpes Zoster
053	Herpes Zoster	Disease	Infectious Disease	Varicella/Herpes Zoster
054.1	Genital Herpes	Disease	Infectious Disease	Sexually Transmitted Diseases
055	Measles	Disease	Infectious Disease	Measles
057.0	Fifth Disease	Disease	Infectious Disease	Other Viral Disorders
060	Yellow Fever	Disease	Infectious Disease	Vector-Borne Disease
061	Dengue	Disease	Infectious Disease	Vector-Borne Disease
062	Mosquito Borne Viral Encephalitis	Disease	Infectious Disease	Vector-Borne Disease
063.9	Tick-Borne Viral Encephalitis Unspecified	Disease	Infectious Disease	Vector-Borne Disease
065	Arthropods-Borne Hemorrhagic Fever	Disease	Infectious Disease	Vector-Borne Disease
066.40	West Nile Fever, Unspecified	Disease	Infectious Disease	Vector-Borne Disease
070.1	Viral Hepatitis	Disease	Infectious Disease	Other Viral Disorders
071	Rabies	Disease	Infectious Disease	Rabies
072.8	Mumps With Unspecified Complication	Disease	Infectious Disease	Mumps
072.9	Mumps Without Complication	Disease	Infectious Disease	Mumps
076	Trachoma	Disease	Eye Disorders	Eye Inflammation
078.0	Molluscum Contagiosum	Disease	Skin Disorders	Other Skin Disorders
078.1	Viral Warts	Disease	Skin Disorders	Other Skin Disorders
078.4	Hand, Foot, and Mouth Disease	Disease	Infectious Disease	Other Viral Disorders
079.3	Rhinovirus Infection In Conditions Elsewhere Unspecified	Disease	Respiratory Disorders	Other Respiratory Disorders
079.99	Unspecified Viral Infection	Disease	Infectious Disease	Other Viral Disorders
082	Tick Borne-Rickettsiosis	Disease	Infectious Disease	Vector-Borne Disease

Note: Red ICD-9s are the expanded set of conditions not included in the DMMPO range of ICD-9s. NOS = not otherwise specified.

ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
084	Malaria	Disease	Infectious Disease	Vector-Borne Disease
085	Leishmaniasis	Disease	Infectious Disease	Vector-Borne Disease
086	Trypanosomiasis	Disease	Infectious Disease	Vector-Borne Disease
091	Early Primary Syphilis	Disease	Infectious Disease	Sexually Transmitted Diseases
091.9	Secondary Syphilis	Disease	Infectious Disease	Sexually Transmitted Diseases
094	Neurosyphilis	Disease	Infectious Disease	Sexually Transmitted Diseases
098.5	Gonococcal Arthritis	Disease	Musculoskeletal Disorders	Arthritis
099.4	Non-Gonococcal Urethritis	Disease	Genitourinary Disorders	Urinary Tract Infection
100	Leptospirosis Unspecified	Disease	Infectious Disease	Leptospirosis
110.9	Dermatophytosis	Disease	Skin Disorders	Fungal Infection
128.9	Helminth Infection	Disease	Gastrointestinal Disorders	Worm Infestation
132.9	Pediculosis Unspecified	Disease	Skin Disorders	Lice
133.0	Scabies	Disease	Skin Disorders	Scabies
184	Malignant Neoplasm of Other and Unspecified Female Genital Organs	Disease	Neoplasm	Gynecologic Neoplasm
239.0	Neoplasm of Unspecified Nature	Disease	Neoplasm	Other Neoplasm
246.9	Other Disorders of Thyroid	Disease	Metabolism Disorders	Thyroid Diseases
250.0	Diabetes Mellitus	Disease	Metabolism Disorders	Diabetes Mellitus
262	Other Severe Protein-Calorie Malnutrition	Disease	Nutritional Disorders	Malnutrition
264	Vitamin A Deficiency	Disease	Nutritional Disorders	Vitamin A Deficiency
274	Gout	Disease	Metabolism Disorders	Other Metabolism Disorders
276	Disorders of Fluid Electrolyte, & Acid Base Balance	Disease	Metabolism Disorders	Other Metabolism Disorders
276.5	Dehydration	Disease	Nutritional Disorders	Dehydration
277	Other and Unspecified Disorders of Metabolism	Disease	Metabolism Disorders	Other Metabolism Disorders
280	Iron Deficiency Anemia	Disease	Nutritional Disorders	Anemia
296.0	Bipolar Disorder, Single Manic Episode	Disease	Mental Disorders	Other Mental Disorders
298.9	Unspecified Psychosis	Disease	Mental Disorders	Psychotic Disorders
300.00	Anxiety State Unspecified	Disease	Mental Disorders	Anxiety/Stress
309.0	Adjustment Reaction with Adjustment Disorder/Depressed Mood	Disease	Mental Disorders	Mental Disorders
309.81	Post Traumatic Stress Disorder	Disease	Mental Disorders	Post Trauma Syndrome Disorder
309.9	Unspecified Adjustment Reaction	Disease	Mental Disorders	Mental Disorders
310.2	Post-Concussion Syndrome	Disease	Mental Disorders	Mental Disorders

Note: Red ICD-9s are the expanded set of conditions not included in the DMMPO range of ICD-9s. NOS = not otherwise specified.

ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
345.2	Epilepsy, Petit Mal Status	Disease	Nervous System Disorders	Seizures
345.3	Epilepsy, Grande Mal Status	Disease	Nervous System Disorders	Seizures
346	Migraine	Disease	Nervous System Disorders	Cephalgia/Headache
349.9	Other and Unspecified Disorders of the Nervous System	Disease	Nervous System Disorders	Other Neurologic System Disorder
361	Retinal Detachments and Defects	Disease	Eye Disorders	Other Eye Disorders
364.3	Uveitis NOS	Disease	Eye Disorders	Eye Inflammation
365	Glaucoma	Disease	Eye Disorders	Glaucoma
366	Cataract	Disease	Eye Disorders	Cataract
369	Blindness and Low Vision	Disease	Eye Disorders	Blindness
370.0	Corneal Ulcer	Disease	Eye Disorders	Other Eye Disorders
372.3	Conjunctivitis Unspecified	Disease	Eye Disorders	Eye Inflammation
379	Other Disorders of Eye	Disease	Eye Disorders	Other Eye Disorders
379.31	Aphakia	Disease	Eye Disorders	Other Eye Disorders
380.1	Infective Otitis Externa	Disease	Ear Disorders	Otitis Externa
380.4	Impacted Cerumen	Disease	Ear Disorders	Impacted Cerumen
380.9	Unspecified Disorder of External Ear	Disease	Ear Disorders	External Ear Disorder
381	Acute Nonsuppurative Otitis Media	Disease	Ear Disorders	Otitis Media
381.9	Unspecified Eustachian Tube Disorders	Disease	Ear Disorders	Other Ear Disorders
383.1	Chronic Mastoiditis	Disease	Ear Disorders	Mastoiditis
384.2	Perforated Tympanic Membrane	Disease	Ear Disorders	Other Ear Disorders
386.1	Other and Unspecified Peripheral Vertigo	Disease	Nervous System Disorders	Vertigo
386.2	Vertigo of Central Origin	Disease	Nervous System Disorders	Vertigo
388	Other Disorders of Ear	Disease	Ear Disorders	Other Ear Disorders
388.3	Tinnitus	Disease	Ear Disorders	Other Ear Disorders
389.9	Unspecified Hearing Loss	Disease	Ear Disorders	Hearing Loss
401	Hypertension	Disease	Cardiovascular Disorders	Hypertension
410	Myocardial Infarction	Disease	Cardiovascular Disorders	Vascular Disorders
411.81	Acute Coronary Occlusion Without Myocardial Infarction	Disease	Cardiovascular Disorders	Acute Coronary Syndrome
413.9	Other and Unspecified Angina Pectoris	Disease	Cardiovascular Disorders	Other Cardiovascular Disorders
427.9	Cardiac Dysrhythmia Unspecified	Disease	Cardiovascular Disorders	Other Cardiovascular Disorders
428	Heart Failure	Disease	Cardiovascular Disorders	Heart Failure
437.9	Cerebrovascular Disease Unspecified	Disease	Cardiovascular Disorders	Other Cardiovascular Disorders
443	Other Peripheral Vascular Disease	Disease	Cardiovascular Disorders	Vascular Disorders
453.42	Venous Emboli/Deep Thrombosis of Deep Vessel Lower Extremity	Disease	Cardiovascular Disorders	Vascular Disorders

Note: Red ICD-9s are the expanded set of conditions not included in the DMMPO range of ICD-9s. NOS = not otherwise specified.

ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
459.9	Other Disorders of Circulatory System	Disease	Cardiovascular Disorders	Other Cardiovascular Disorders
462	Acute Pharyngitis	Disease	Respiratory Disorders	Upper Respiratory Tract Infection
465	Acute Upper Respiratory Tract Infection of Multiple Or Unspecified Sites	Disease	Respiratory Disorders	Upper Respiratory Tract Infection
466	Acute Bronchitis and Bronchiolitis	Disease	Respiratory Disorders	Bronchitis
475	Peritonsillar Abscess	Disease	Respiratory Disorders	Other Respiratory Disorders
477.9	Allergic Rhinitis Cause Unspecified	Disease	Respiratory Disorders	Allergies
486	Pneumonia Organism Unspecified	Disease	Respiratory Disorders	Pneumonia and Lower Respiratory Tract Infection
491	Chronic Bronchitis	Disease	Respiratory Disorders	Bronchitis
492	Emphysema	Disease	Respiratory Disorders	Chronic Obstructive Pulmonary Diseases (COPD)
493.9	Asthma	Disease	Respiratory Disorders	Asthma
519.8	Other Diseases of Respiratory System	Disease	Respiratory Disorders	Other Respiratory Disorders
521.0	Dental Caries	Disease	Dental and Oral Disorders	Dental Caries
522.0	Pulpitis	Disease	Dental and Oral Disorders	Dental Infection
523	Gingival and Periodontal Disease	Disease	Dental and Oral Disorders	Gingival Disorders
525	Other Diseases and Conditions of the Teeth and Supporting Structures	Disease	Dental and Oral Disorders	Other Oral Cavity Disorders
527	Diseases of the Salivary Glands	Disease	Dental and Oral Disorders	Oral Mucosal Diseases
530.2	Ulcer of Esophagus	Disease	Gastrointestinal Disorders	Digestive Disorders
530.81	Gastro-esophageal Reflux	Disease	Gastrointestinal Disorders	Digestive Disorders
531	Gastric Ulcer	Disease	Gastrointestinal Disorders	Dyspepsia Syndrome/Gastritis/Ulcers
532	Duodenal Ulcer	Disease	Gastrointestinal Disorders	Dyspepsia Syndrome/Gastritis/Ulcers
540.9	Appendicitis NOS	Disease	Gastrointestinal Disorders	Appendectomy
541	Acute Appendicitis	Disease	Gastrointestinal Disorders	Appendectomy
550.9	Unilateral Inguinal Hernia	Disease	Gastrointestinal Disorders	Herniotomy
553.1	Umbilical Hernia	Disease	Gastrointestinal Disorders	Herniotomy
553.9	Hernia NOS	Disease	Gastrointestinal Disorders	Herniotomy
564.0	Constipation	Disease	Gastrointestinal Disorders	Digestive Disorders
564.1	Irritable Bowel Disease	Disease	Gastrointestinal Disorders	Digestive Disorders

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ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
566	Abscess Anal Rectal Regions	Disease	Gastrointestinal Disorders	Other Gastroenterohepatology Disorders
567.9	Unspecified Peritonitis	Disease	Gastrointestinal Disorders	Other Gastroenterohepatology Disorders
569.83	Other Disorders of Intestine	Disease	Gastrointestinal Disorders	Other Gastroenterohepatology Disorders
571.4	Chronic Hepatitis	Disease	Gastrointestinal Disorders	Hepatitis/Cirrhosis Hepatic/Jaundice
571.5	Cirrhosis of Liver Without Alcohol	Disease	Gastrointestinal Disorders	Hepatitis/Cirrhosis Hepatic/Jaundice
574	Cholelithiasis	Disease	Gastrointestinal Disorders	Laparotomy
577.0	Acute Pancreatitis	Disease	Gastrointestinal Disorders	Other Gastroenterohepatology Disorders
577.1	Chronic Pancreatitis	Disease	Gastrointestinal Disorders	Other Gastroenterohepatology Disorders
578.9	Hemorrhage of Gastrointestinal Tract Unspecified	Disease	Gastrointestinal Disorders	Other Gastroenterohepatology Disorders
584.9	Acute Renal Failure Unspecified	Disease	Genitourinary Disorders	Other Upper Respiratory Tract Infection System Disorders
592	Calculus of Kidney	Disease	Genitourinary Disorders	Other Upper Respiratory Tract Infection System Disorders
594.9	Calculus of Lower Urinary Tract Unspecified	Disease	Genitourinary Disorders	Urinary Tract Calculi
599.0	Unspecified Urinary Tract Infection	Disease	Genitourinary Disorders	Urinary Tract Infection
599.7	Hematuria	Disease	Genitourinary Disorders	Other Urinary System Disorders
599.8	Other Specified Disorders of Urethra and Urinary Tract	Disease	Genitourinary Disorders	Other Urinary System Disorders
600	Hyperplasia of Prostate	Disease	Genitourinary Disorders	Hyperplasia of Prostate
608	Other Disorders of Male Genital Organs	Disease	Genitourinary Disorders	Other Genital Disorders
608.2	Torsion of Testis	Disease	Genitourinary Disorders	Other Genital Disorders
608.4	Other Inflammatory Disorders Male Genital Organs	Disease	Genitourinary Disorders	Other Genital Disorders
611.7	Breast Lump	Disease	Genitourinary Disorders	Other Genital Disorders
614.9	Unspecified Inflammatory Disease of Female Pelvic Organs and Tissues	Disease	Obstetric and Gynecologic Disorders	Pelvic Inflammatory Diseases
616.1	Vaginitis and Vulvovaginitis Unspecified	Disease	Obstetric and Gynecologic Disorders	Vaginitis

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623.5	Leukorrhea Not Specified As Infective	Disease	Genitourinary Disorders	Leukorrhea
626.8	Disorders of Menstruation and Other Abnormal Bleeding from Female Genital Tract	Disease	Obstetric and Gynecologic Disorders	Menstrual Disorders
629	Other Disorders of Female Genital Organs	Disease	Genitourinary Disorders	Other Genital Disorders
633	Ectopic Pregnancy	Disease	Obstetric and Gynecologic Disorders	Pregnancy Disorder
634	Spontaneous Abortion	Disease	Obstetric and Gynecologic Disorders	Pregnancy Disorder
650	Normal Delivery	Disease	Obstetric and Gynecologic Disorders	Complicated Labor and Normal Delivery
653	Disproportion In Pregnancy Labor and Delivery	Disease	Obstetric and Gynecologic Disorders	Complicated Labor and Normal Delivery
681	Cellulitis and Abscess of Finger and Toe	Disease	Skin Disorders	Bacterial Infection
682.0	Cellulitis and Abscess of Face	Disease	Skin Disorders	Bacterial Infection
682.6	Cellulitis and Abscess of Leg Except Foot	Disease	Skin Disorders	Bacterial Infection
682.7	Cellulitis and Abscess of Foot Except Toes	Disease	Skin Disorders	Bacterial Infection
682.9	Cellulitis and Abscess of Unspecified Parts	Disease	Skin Disorders	Bacterial Infection
690	Erythematosquamous Dermatosis	Disease	Skin Disorders	Dermatitis
691	Atopic Dermatitis and Related Conditions	Disease	Skin Disorders	Dermatitis
692.9	Contact Dermatitis and Other Eczema	Disease	Skin Disorders	Dermatitis
693	Dermatitis Due To Substances Taken Internally	Disease	Skin Disorders	Dermatitis
696.1	Other Psoriasis and Similar Disorders	Disease	Skin Disorders	Psoriasis
709	Other Disorders of Skin and Subcutaneous Tissue	Disease	Skin Disorders	Other Skin Disorders
714	Rheumatoid Arthritis	Disease	Musculoskeletal Disorders	Arthritis
719.41	Pain In Joint Involving Shoulder Region	Disease	Musculoskeletal Disorders	Joint Pain
719.46	Pain In Joint Involving Lower Leg	Disease	Musculoskeletal Disorders	Joint Pain
719.47	Pain In Joint Involving Ankle and Foot	Disease	Musculoskeletal Disorders	Joint Pain
722.1	Displacement Lumbar Intervertebral Disc without Myelopathy	Disease	Musculoskeletal Disorders	Back Pain
723.0	Spinal Stenosis In Cervical Region	Disease	Musculoskeletal Disorders	Back Pain
724.02	Other and Unspecified Disorders of Back	Disease	Musculoskeletal Disorders	Back Pain
724.2	Lumbago	Disease	Musculoskeletal Disorders	Back Pain
724.3	Sciatica	Disease	Musculoskeletal Disorders	Back Pain
724.4	Thoracic Or Lumbosacral Neuritis Or Radiculitis Unspecified	Disease	Musculoskeletal Disorders	Back Pain

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ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
724.5	Backache Unspecified	Disease	Musculoskeletal Disorders	Back Pain
726.10	Disorders of Bursae and Tendons In Shoulder, Unspecified	Disease	Musculoskeletal Disorders	Joint Pain
726.12	Bicipital Tenosynovitis	Disease	Musculoskeletal Disorders	Joint Pain
726.3	Enthesopathy of Elbow Region	Disease	Musculoskeletal Disorders	Joint Pain
726.4	Enthesopathy of Wrist and Carpus	Disease	Musculoskeletal Disorders	Joint Pain
726.5	Enthesopathy of Hip Region	Disease	Musculoskeletal Disorders	Joint Pain
726.6	Enthesopathy of Knee	Disease	Musculoskeletal Disorders	Joint Pain
726.7	Enthesopathy of Ankle and Tarsus	Disease	Musculoskeletal Disorders	Joint Pain
729.0	Rheumatism Unspecified and Fibrositis	Disease	Musculoskeletal Disorders	Muscle Pain
729.5	Pain In Limb	Disease	Musculoskeletal Disorders	Muscle Pain
733.9	Other Disorders of Bone and Cartilage	Disease	Musculoskeletal Disorders	Other Neuromusculoskeletal Disorders
779	Other and Ill-Defined Conditions Originating In the Peri-natal Period	Disease	Obstetric and Gynecologic Disorders	Other Obstetric and Gynecological Disorders
780.0	Alterations of Consciousness	Disease	General Symptoms	Observation Fever
780.2	Syncope	Disease	General Symptoms	Observation Fever
780.39	Other Convulsions	Disease	General Symptoms	Observation Fever
780.5	Sleep Disturbances	Disease	Mental Disorders	Anxiety/Stress
780.6	Fever	Disease	General Symptoms	Observation Fever
780.79	Other Malaise and Fatigue	Disease	General Symptoms	Malaise/Fatigue
780.96	Generalized Pain	Disease	General Symptoms	Generalized Pain
782.1	Rash and Other Nonspecific Skin Eruptions	Disease	Skin Disorders	Other Skin Disorders
782.3	Edema	Disease	General Symptoms	Other Skin Disorders
783.0	Anorexia	Disease	Mental Disorders	Other Mental Disorders
784.0	Headache	Disease	General Symptoms	Headache
784.7	Epistaxis	Disease	General Symptoms	Observation Fever
784.8	Hemorrhage from Throat	Disease	General Symptoms	Observation Fever
786.2	Cough	Disease	General Symptoms	Cough
786.5	Chest Pain	Disease	General Symptoms	Chest Pain

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787.0	Nausea and Vomiting	Disease	General Symptoms	Observation Fever
787.91	Diarrhea NOS	Disease	Gastrointestinal Disorders	Diarrhea/Enterocolitis
789.00	Abdominal Pain Unspecified Site	Disease	General Symptoms	Abdominal Pain
800.0	Closed Fracture of Vault of Skull without Intracranial Injury	Trauma	Fractures	Skull
801.0	Closed Fracture of Base of Skull without Intracranial Injury	Trauma	Fractures	Skull
801.76	Open Fracture Base of Skull with Subarachnoid, Subdural, Extradural Hematoma	Trauma	Fractures	Skull
802.0	Closed Fracture of Nasal Bones	Trauma	Fractures	Facial
802.1	Open Fracture of Nasal Bones	Trauma	Fractures	Facial
802.6	Fracture Orbital Floor Closed (Blowout)	Trauma	Fractures	Facial
802.7	Fracture Orbital Floor Open (Blowout)	Trauma	Fractures	Facial
802.8	Closed Fracture of Other Facial Bones	Trauma	Fractures	Facial
802.9	Open Fracture of Other Facial Bones	Trauma	Fractures	Facial
805.0	Closed Fracture of Cervical Vertebra without Spinal Cord Injury	Trauma	Fractures	Spine
806.1	Open Fracture of Cervical Vertebra with Spinal Cord Injury	Trauma	Fractures	Spine
806.2	Closed Fracture of Dorsal Vertebra with Spinal Cord Injury	Trauma	Fractures	Spine
806.3	Open Fracture of Dorsal Vertebra with Spinal Cord Injury	Trauma	Fractures	Spine
806.4	Closed Fracture of Lumbar Spine with Spinal Cord Injury	Trauma	Fractures	Spine
806.5	Open Fracture of Lumbar Spine with Spinal Cord Injury	Trauma	Fractures	Spine
806.60	Closed Fracture Sacrum and Coccyx with Unspecified Spinal Cord Injury	Trauma	Fractures	Spine
806.70	Open Fracture Sacrum and Coccyx with Unspecified Spinal Cord Injury	Trauma	Fractures	Spine
807.0	Closed Fracture of Ribs	Trauma	Fractures	Rib
807.1	Open Fracture of Ribs	Trauma	Fractures	Rib
807.2	Closed Fracture of Sternum	Trauma	Fractures	Rib
807.3	Open Fracture of Sternum	Trauma	Fractures	Rib
808.8	Fracture of Pelvis Unspecified, Closed	Trauma	Fractures	Pelvis
808.9	Fracture of Pelvis Unspecified, Open	Trauma	Fractures	Pelvis
810.0	Clavicle Fracture, Closed	Trauma	Fractures	Upper Arm/Shoulder
810.1	Clavicle Fracture, Open	Trauma	Fractures	Upper Arm/Shoulder
810.12	Open Fracture of Shaft of Clavicle	Trauma	Fractures	Upper Arm/Shoulder
811.0	Fracture of Scapula, Closed	Trauma	Fractures	Upper Arm/Shoulder
811.1	Fracture of Scapula, Open	Trauma	Fractures	Upper Arm/Shoulder
812.00	Fracture of Unspecified Part of Upper End of Humerus, Closed	Trauma	Fractures	Upper Arm/Shoulder
813.8	Fracture of Unspecified Part of Radius and Ulna, Closed	Trauma	Fractures	Radius/Ulna

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813.9	Fracture of Unspecified Part of Radius with Ulna Open	Trauma	Fractures	Radius/Ulna
815.0	Closed Fracture of Metacarpal Bones	Trauma	Fractures	Hand/Finger
816.0	Phalanges Fracture, Closed	Trauma	Fractures	Hand/Finger
816.1	Phalanges Fracture, Open	Trauma	Fractures	Hand/Finger
817.0	Multiple Closed Fractures of Hand Bones	Trauma	Fractures	Hand/Finger
817.1	Multiple Open Fracture of Hand Bones	Trauma	Fractures	Hand/Finger
820.8	Femur, Neck Fracture, Closed	Trauma	Fractures	Femur
820.9	Femur Neck Fracture, Open	Trauma	Fractures	Femur
821.01	Fracture Femur Shaft, Closed	Trauma	Fractures	Femur
821.11	Fracture Femur Shaft, Open	Trauma	Fractures	Femur
822.0	Closed Fracture of Patella	Trauma	Fractures	Tibia/Fibula/Knee
822.1	Open Fracture of Patella	Trauma	Fractures	Tibia/Fibula/Knee
823.82	Tibia/Fibula Fracture, Closed	Trauma	Fractures	Tibia/Fibula/Knee
823.9	Fracture of Unspecified Part of Tibia and Fibula Open	Trauma	Fractures	Tibia/Fibula/Knee
824.8	Ankle Fracture, Closed	Trauma	Fractures	Tibia/Fibula/Knee
824.9	Ankle Fracture, Open	Trauma	Fractures	Tibia/Fibula/Knee
825.0	Fracture of Calcaneous Closed	Trauma	Fractures	Foot/Ankle
826.0	Closed Fracture of One Or More Phalanges Foot	Trauma	Fractures	Foot/Ankle
829.0	Fracture of Unspecified Bone Closed	Trauma	Fractures	Unspecified
830.0	Closed Dislocation of Jaw	Trauma	Dislocations	Jaw
830.1	Open Dislocation of Jaw	Trauma	Dislocations	Jaw
831.0	Dislocation Shoulder	Trauma	Dislocations	Shoulder
831.04	Closed Dislocation of Acromioclavicular Joint	Trauma	Dislocations	Shoulder
831.1	Open Dislocation of Shoulder	Trauma	Dislocations	Shoulder
832.0	Dislocation Elbow, Closed	Trauma	Dislocations	Elbow
832.1	Dislocation Elbow, Open	Trauma	Dislocations	Elbow
833.0	Wrist Dislocation, Closed	Trauma	Dislocations	Hand/Wrist/Finger
833.1	Wrist Dislocation, Open	Trauma	Dislocations	Hand/Wrist/Finger
834.0	Dislocation Finger, Closed	Trauma	Dislocations	Hand/Wrist/Finger
834.1	Dislocation Finger, Open	Trauma	Dislocations	Hand/Wrist/Finger
835.0	Closed Dislocation of Hip	Trauma	Dislocations	Hip
835.1	Hip Dislocation Open	Trauma	Dislocations	Hip
836.0	Medical Meniscus Tear Knee	Trauma	Dislocations	Knee
836.1	Lateral Meniscus Tear Knee	Trauma	Dislocations	Knee
836.2	Meniscus Tear of Knee, NOS	Trauma	Dislocations	Knee
836.5	Dislocation Knee, Closed	Trauma	Dislocations	Knee
836.6	Other Dislocation of Knee Open	Trauma	Dislocations	Knee
839.01	Closed Dislocation First Cervical Vertebra	Trauma	Dislocations	Back
840.4	Rotator Cuff Sprain	Trauma	Sprains/Strains	Shoulder
840.9	Sprain, Shoulder/Army NOS	Trauma	Sprains/Strains	Shoulder
842.00	Sprain of Unspecified Site of Wrist	Trauma	Sprains/Strains	Wrist
843	Sprains and Strains of Hip and Thigh	Trauma	Sprains/Strains	Hip

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ICD-9	ICD-9 description	Disease/ trauma	ICD-9 category	ICD-9 sub-category
844.9	Sprain Knee	Trauma	Sprains/Strains	Knee
845.0	Ankle Sprain	Trauma	Sprains/Strains	Ankle
846.0	Lumbosacral (Joint) (Ligament) Sprain	Trauma	Sprains/Strains	Back/Neck
846	Sprains and Strains of Sacroiliac Region	Trauma	Sprains/Strains	Back/Neck
847.2	Lumbar Sprain	Trauma	Sprains/Strains	Back/Neck
847.3	Sprain of Sacrum	Trauma	Sprains/Strains	Back/Neck
848.1	Jaw Sprain	Trauma	Sprains/Strains	Jaw
848.3	Sprain of Ribs	Trauma	Sprains/Strains	Chest
850.9	Concussion	Trauma	Intracranial	Concussion Mild
851.00	Cortex Contusion, without Open Intracranial Wound Concussion Unspecified	Trauma	Intracranial	Concussion Severe
851.01	Cerebral Contusion without Open Wound No Loss of Consciousness	Trauma	Intracranial	Concussion Severe
852	Subarachnoid Subdural Extradural Hemorrhage Injury	Trauma	Intracranial	Concussion Severe
853.0	Other and Unspecified Intracranial Hemorrhage Injury without Open Wound	Trauma	Intracranial	Concussion Severe
853.15	Unspecified Intracranial Hemorrhage without Open Intracranial Wound	Trauma	Intracranial	Concussion Severe
860.0	Traumatic Pneumothorax without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
860.1	Traumatic Pneumothorax without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
860.2	Traumatic Hemothorax without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
860.3	Traumatic Hemothorax without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
860.4	Traumatic Pneumohemothorax without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
860.5	Traumatic Pneumohemothorax without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
861.0	Injury To Heart without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
861.10	Unspecified Injury of Heart without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
861.2	Lung Injury without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
861.3	Lung Injury without Open Wound Into Thorax	Trauma	Internal Injuries	Thorax
863.0	Injury To Stomach without Open Wound Into Cavity	Trauma	Internal Injuries	Abdomen
864.10	Unspecified Injury To Liver without Open Wound Into Cavity	Trauma	Internal Injuries	Abdomen
865	Injury To Spleen	Trauma	Internal Injuries	Abdomen
866.0	Injury Kidney without Open Wound	Trauma	Internal Injuries	Abdomen
866.1	Injury To Kidney With Open Wound Into Cavity	Trauma	Internal Injuries	Abdomen
867.0	Injury To Bladder Urethra Without Injury To Bladder Urethra Without Open Wound Into Cavity	Trauma	Internal Injuries	Pelvis
867.1	Injury To Bladder Urethra without Open Wound Into Cavity	Trauma	Internal Injuries	Pelvis

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867.2	Injury To Ureter without Open Wound Into Cavity	Trauma	Internal Injuries	Pelvis
867.3	Injury To Ureter without Open Wound Into Cavity	Trauma	Internal Injuries	Pelvis
867.4	Injury To Uterus without Open Wound Into Cavity	Trauma	Internal Injuries	Pelvis
867.5	Injury To Uterus without Open Wound Into Cavity	Trauma	Internal Injuries	Pelvis
870	Open Wound of Ocular Adnexa	Trauma	Open Wounds	Eye
870.3	Penetrating Wound of Orbit without Foreign Body	Trauma	Open Wounds	Eye
870.4	Penetrating Wound of Orbit with Foreign Body	Trauma	Open Wounds	Eye
871.5	Penetration of Eyeball with Magnetic Foreign Body	Trauma	Open Wounds	Eye
872	Open Wound of Ear	Trauma	Open Wounds	Face/Neck
873.4	Open Wound of Face without Mention of Complication	Trauma	Open Wounds	Face/Neck
873.8	Open Head Wound without Complication	Trauma	Open Wounds	Head
873.9	Open Head Wound with Complication	Trauma	Open Wounds	Head
874.8	Open Wound of Other Unspecified Parts of Neck without Complication	Trauma	Open Wounds	Face/Neck
875.0	Open Wound of Chest Wall without Complication	Trauma	Open Wounds	Chest
876.0	Open Wound of Back without Complication	Trauma	Open Wounds	Torso
877.0	Open Wound of Buttock without Complication	Trauma	Open Wounds	Torso
878	Open Wound of Genital Organs (Ext) Including Traumatic Amputation	Trauma	Open Wounds	Torso
879.2	Open Wound of Abdominal Wall Anterior without Complication	Trauma	Open Wounds	Abdomen
879.6	Open Wound Other Unspecified Parts Trunk without Complication	Trauma	Open Wounds	Torso
879.8	Open Wound(S) (Multiple) of Unspecified Site(S) without Complication	Trauma	Open Wounds	Back/Buttocks
880	Open Wound Shoulder Upper Arm	Trauma	Open Wounds	Shoulder
881	Open Wound Elbow, Forearm, Wrist	Trauma	Open Wounds	Arm
882	Open Wound Hand Except Fingers Alone	Trauma	Open Wounds	Hand/Finger
883.0	Open Wound of Fingers without Complication	Trauma	Open Wounds	Hand/Finger
884.0	Multiple and Unspecified Open Wound of Upper Limb without Complication	Trauma	Open Wounds	Shoulder
885	Traumatic Amputation of Thumb (Complete, Partial)	Trauma	Amputations	Hand
886	Traumatic Amputation of Other Finger(S) (Complete, Partial)	Trauma	Amputations	Hand
887	Traumatic Amputation of Arm and Hand (Complete) (Partial) Unilateral Below Elbow Without Complication	Trauma	Amputations	Forearm
890	Open Wound of Hip and Thigh	Trauma	Open Wounds	Leg
891	Open Wound Knee, Leg (Except Thigh) and Ankle	Trauma	Open Wounds	Leg
892.0	Open Wound Foot, Except Toes, Alone without Complications	Trauma	Open Wounds	Foot/Ankle/Toe

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894.0	Multiple and Unspecified Open Wound of Lower Limb without Complications	Trauma	Open Wounds	Leg
895	Traumatic Amputation of Toe(S) (Complete, Partial)	Trauma	Amputations	Foot
896	Traumatic Amputation of Foot (Complete) (Partial)	Trauma	Amputations	Foot
897	Traumatic Amputation of Leg(S) (Complete) (Partial) Unilateral Below Knee Without Complication	Trauma	Amputations	Leg
903	Injury To Blood Vessels of Upper Extremity	Trauma	Other Injury	Blood Vessel Injury
904	Injury To Blood Vessels of Lower Extremity and Unspecified Sites	Trauma	Other Injury	Blood Vessel Injury
910.0	Abrasion/Friction Burn of Face/Neck/Scalp/Eye without Infection	Trauma	Superficial/Contusions	Face/Neck
916.0	Abrasion/Friction Burn of Hip/Thigh/Leg/Ankle without Infection	Trauma	Superficial/Contusions	Leg
916.1	Abrasion/Friction Burn of Hip/Thigh/Leg/Ankle with Infection	Trauma	Superficial/Contusions	Leg
916.2	Blister of Hip, Thigh, Leg, Ankle, without Infection	Trauma	Superficial/Contusions	Leg
916.3	Blister of Hip/Thigh/Leg/Ankle Infected	Trauma	Superficial/Contusions	Leg
916.4	Insect Bite Non-venomous Hip, Thigh, Leg, Ankle, without Infection	Trauma	Insect/Animal Bites	Bites
916.5	Insect Bite Non-venomous Hip, Thigh, Leg, Ankle with Infection	Trauma	Insect/Animal Bites	Bites With Infection
918.1	Superficial Injury Cornea	Trauma	Superficial/Contusions	Eye
920	Contusion of Face, Scalp, and Neck Except Eye(s)	Trauma	Superficial/Contusions	Face/Neck
921.0	Black Eye Not Otherwise Spec	Trauma	Superficial/Contusions	Eye
922.1	Contusion of Chest Wall	Trauma	Superficial/Contusions	Chest
922.2	Contusion of Abdominal Wall	Trauma	Superficial/Contusions	Abdomen
922.4	Contusion of Genital Organs	Trauma	Superficial/Contusions	Abdomen
924.1	Contusion of Knee and Lower Leg	Trauma	Superficial/Contusions	Leg
924.2	Contusion of Ankle and Foot	Trauma	Superficial/Contusions	Foot/Toes
924.3	Contusion of Toe	Trauma	Superficial/Contusions	Foot/Toes
925	Crushing Injury of Face, Scalp, & Neck	Trauma	Crush Injuries	Head/Face/Neck
926	Crushing Injury of Trunk	Trauma	Crush Injuries	Pelvis/Urogenital
927	Crushing Injury of Upper Limb	Trauma	Crush Injuries	Upper Extremities
928	Crushing Injury of Lower Limb	Trauma	Crush Injuries	Lower Extremities
930	Foreign Body On External Eye	Trauma	Other Injury	Foreign Body
935	Foreign Body In Mouth, Esophagus, and Stomach	Trauma	Other Injury	Foreign Body
941	Burn of Face, Head, Neck	Trauma	Burns	Head
942.0	Burn of Trunk, Unspecified Degree	Trauma	Burns	Trunk

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943.0	Burn of Upper Limb Except Wrist and Hand Unspecified Degree	Trauma	Burns	Upper Extremities
944	Burn of Wrist(S) and Hand(s)	Trauma	Burns	Upper Extremities
945	Burn of Lower Limb(s)	Trauma	Burns	Lower Extremities
950	Injury To Optic Nerve and Pathways	Trauma	Other Injury	Nerve Injury
953.0	Injury To Cervical Nerve Root	Trauma	Other Injury	Nerve Injury
953.4	Injury To Brachial Plexus	Trauma	Other Injury	Nerve Injury
955.0	Injury To Axillary Nerve	Trauma	Other Injury	Nerve Injury
956.0	Injury To Sciatic Nerve	Trauma	Other Injury	Nerve Injury
959.01	Other and Unspecified Injury To Head	Trauma	Intracranial	Concussion Mild
959.09	Other and Unspecified Injury Face and Neck	Trauma	Superficial/Contusions	Face/Neck
959.7	Other and Unspecified Injury To Knee, Leg, Ankle, Foot	Trauma	Superficial/Contusions	Leg
989.5	Toxic Effect of Venom	Trauma	Insect/Animal Bites	Venom
989.9	Toxic Effect of Unspecified Substance Chiefly Non-Medicinal	Trauma	Other Injury	Toxic Effects/Shock
991.3	Frostbite	Trauma	Environmental	Cold
991.6	Hypothermia	Trauma	Environmental	Cold
992.0	Heat Stroke and Sun Stroke	Trauma	Environmental	Heat
992.2	Heat Cramps	Trauma	Environmental	Heat
992.3	Heat Exhaustion Anhydrotic	Trauma	Environmental	Heat
994.0	Effects of Lightning	Trauma	Other Injury	Post-Concussion Syndrome
994.1	Drowning and Nonfatal Submersion	Trauma	Other Injury	Drowning
994.2	Effects of Deprivation of Food	Trauma	Other Injury	Hunger
994.3	Effects of Thirst	Trauma	Other Injury	Thirst
994.4	Exhaustion Due To Exposure	Trauma	Other Injury	Exhaustion
994.5	Exhaustion Due To Excessive Exertion	Trauma	Other Injury	Exhaustion
994.6	Motion Sickness	Trauma	Other Injury	Motion Sickness
994.8	Electrocution and Nonfatal Effects of Electric Current	Trauma	Other Injury	Electrocution Non-Fatal
995.0	Other Anaphylactic Shock Not Elsewhere Classified	Trauma	Other Injury	Toxic Effects/Shock
E991.2	Injury Due To War Ops from Other Bullets (Not Rubber/Pellets)	Trauma	Other Injury	Unspecified Injury Due To War
E991.3	Injury Due To War Ops from Antipersonnel Bomb Fragments	Trauma	Other Injury	Unspecified Injury Due To War
E991.9	Injury Due To War Ops Other Unspecified Fragments	Trauma	Other Injury	Unspecified Injury Due To War
E993	Injury Due To War Ops By Other Explosion	Trauma	Other Injury	Unspecified Injury Due To War
V01.5	Contact without Exposure To Rabies	Trauma	Insect/Animal Bites	Rabies
V79.0	Screening For Depression	Trauma	Mental Disorders	Other Mental Disorders

Note: Red ICD-9s are the expanded set of conditions not included in the DMMPO range of ICD-9s. NOS = not otherwise specified.

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14. ABSTRACT

The U.S. military is increasingly tasked to implement medical stability operations (MSOs). Current mandates by the Under Secretary of Defense for Personnel and Readiness establishes MSOs as a core U.S. military mission that the Military Health System (MHS) shall be prepared to conduct across the range of military operations (ROMO), including combat and noncombat environments. MSOs are given priority comparable to combat operations and are integrated across all MHS activities. However, programming the materiel resources in support of military operations that span the ROMO is contingent on accurately projecting the types of illness and injures that are likely to be received at deployed medical treatment facilities.

This paper explains the methodology for developing accurate patient stream compositions for the ROMO. These missions include combat, noncombat, humanitarian assistance (HA), and disaster relief (DR) missions. This effort began with data development and then tool development. Using the Patient Condition Occurrence Frequency tool, a patient stream may be modified and adjustment factors may be applied to the scenario for age, gender, country, region, and more. The approach taken in this study leveraged available data collected after rigorous research. This research provided underlying data for a range of combat and noncombat missions.

15. SUBJECT TERMS
patient condition occurrence frequency, PCOF, range of military operations, ROMO, combat, noncombat, humanitarian assistance, HA, disaster relief, DR, methodology

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